Volume 94 Number 10

STEEL

Production • Processing • Distribution • Use

The Week in Perspective

PRELIMINARIES at Washington last week probably were more exciting than will be the "main go" now under way. The air was thick with "dead cats" and caustic comment on NRA, involving everyone from Chinese laundries to steel plants. General Johnson tossed out a dozen correctives, to receive immediate attention. All in all, a notable field day for "parlor pinks." pp. 10, 15

TRAFFIC DEPARTMENTS will be interested in publication of a new looseleaf volume listing 480,000 iron and steel freight rates. p. 30

PRODUCTION RATE, still climbing, has eased the pace slightly, rising 1 point to 48 per cent of steelmaking capacity. p. 13

LABOR UNIONS, their treasuries swelling by the addition of thousands of new members, are reported disturbed over agitation for vertical instead of craft unions. p. 15

NEW ERA FOR STEEL, with adroit merchandising in the driver's seat, is heralded by the sales promotion manager of a leading steel company. The trend away from the former come-and-get-it market was signalized by STEEL, Jan. 1, p. 93. p. 16

JANUARY EXPORTS of iron and steel, while off slightly from the December tonnage, were triple the total for January, 1933 p. 13

GOVERNMENT BY DEFAMATION—e.g. air mail contracts, publication of executive salaries—unfairly indicts an entire industry for the misdemeanors of a minority. p. 20

OXYGEN content has been found to have direct bearing on the elevated temperature ductility of highly alloyed steels. p. 28

CORROSION in the grain boundaries of chrome-nickel steels is encountered in high-temperature treatment such as welding. Introduction of columbium into the steel overcomes this difficulty. p. 28

STEEL PLANTS in Great Britain have adopted a "steel code" of their own, in the effort to stimulate and control production and sales of their products. p. 65

PIG IRON PRODUCTION, daily average for February, showed a 15.3 per cent gain over January. Four more stacks went into action, bringing total to 90. p. 14

TWO STROKES OF A PRESS will suffice to form the entire body of an automobile if present experiments in this direction are successful. Steel sheets 7 feet wide and 170 inches long, required for the process, impose new problems for rolling mills. p. 18

DEEP DRAWING, and the calculation of forces involved therein, are investigated this week by STEEL's class in plastic forming of metals. p. 37

TOOL HOLDERS, their use stimulated by needs of the automotive industry, account for about 500 tons of steel annually in their manufacture. p. 34

NEW AUTOMOBILE WHEEL has full-formed spokes, drawn from strip steel, bent circular and flash welded. Spoke unit is held by rivets to the rolled and welded rim, and is chrome-plated for appearance and corrosion resistance. p. 23

MACHINE TOOLS with each succeeding year become more flexible and easier to operate. Proof of this is embodied in a new vertical turret lathe with hydraulic speed shift mechanism. p. 27

INCREASED STRENGTH can be "coaxed" into a metal by applying gradually increasing stresses while rotating, recent research indicates. p. 26

DO YOU NEED flat sheets or coiled strip chromium or nickel plated for fabrication? The material is available in various metal bases. p. 26

Consumers Air NRA Plaints; Plea Made for Capital Goods

WASHINGTON

BUSINESS men restive under what they believe to be oppressive methods of NRA would have received the surprise of their lives if they could have listened in on all the testimony and charges adduced at last week's NRA hearing preliminary to the town meeting of NRA code authorities opening here Monday, March 5.

No criticism of definite codes nor of individuals in NRA and code authorities was permitted. Remarks had to be confined entirely to principles enunciated in codes, but even so shades of criticism and objections crept in and there was plenty of color.

NRA Administrator Johnson thumped the speaker's desk with his accustomed vigor when he enumerated "12 corrective points" for NRA in opening the hearings. Even his grim visage relaxed into a smile when a young consumer representative declared that NRA is in the hands of capitalist-minded men and demanded a new deal in personnel, from the General down.

One of the mildest critics styled NRA "a morganatic marriage between government and special privilege." Mrs. Gifford Pinchot, wife of Pennsylvania's governor, objected to enforcing the law on beauty parlors and Chinese laundries when "the steel industry is openly fighting the government" and cited Bethlehem and Duquesne as two towns in which she had been refused permission to use schoolhouses to exhort steel workers.

Wants Production Costs Filed

One demand voiced by a number of representatives of large distributing and retail organizations was for a system by which manufacturers organized under codes would be forced to file full data as to their production costs.

The necessity for consideration of the interrelationship between certain competitive materials, such as steel, brick, lumber and cement received some thought. If the price of one, in the general economic scale, is a little higher than the others, that material tends to lose its place in the sun.

This suggestion was voiced during a discussion of cost accounting methods, a subject which was mentioned frequently in connecteion with consumer demand for accurate information as to the cost of producing manufactured products.

A typical consumers' viewpoint was expressed by Prof. A. Anton Taylor, New York university: "How can prices, fair to the consumer, be established without information on costs, wages, raw material prices, capitalization?"

Prescribes 12 Correctives

In opening the meeting, General Johnson said that NRA already knew, as the result of its own studies, that the administration needed to be perfected along many lines and he enumerated 12 "corrective points" which, he promised, would receive immediate attention. These were:

1—A more uniform and equitable rule of national price stabilization in those cases where it is necessary to maintain wages at a decent standard against the certain results of predatory and cut-throat competition, and further insurance against increase of price faster and further than increase of purchasing power.

2—A more effective rule on costs for the purposes of maintaining rules against sales below costs of production.

3—Uniformity of wages and hourly rates in competitive industries.

4—Uniform classification of areas for the purpose of North-South differentials.

5—Further reductions in hours per week and further increase in hourly wages.

6—Certainty of protection against monopoly control and oppression of small enterprises and, especially, the inclusion in codes of adequate buying (as well as selling) provision to guard against oppression of small business.

7—A much improved method for securing prompt and effective compliance.

8—A safe method of financing code administration without racketeering and abuse.

9—Elimination of inconsistent or conflicting provisions among various codes.

10—Adequate labor and consumer representation in an advisory capacity on code authorities.

11—Uniformity of governmental representation on code authorities.

12—Wider use of mechanism for settling labor disputes in connection with code administration.

Myron C. Taylor, chairman of the United States Steel Corp., was among those who sat on the speaker's platform at the opening session.

George H. Houston, president, Baldwin Locomotive Works, put in a strong plea on behalf of manufacturers of so-called durable goods. Of the 49,000,000 people in this country normally employed, he said about 23,000,000 are engaged in rendering service and about 26,000,000 in the production of goods.

Hold Key to Employment

In the latter group about 10,500,000 are engaged in agriculture, about 5,500,000 in the production of other "ephemeral goods" and about 10,000,000 in the production of durable goods. The key to the present unemployment situation, he declared, lies with them before there can be much further re-employment. These conditions are necessary, said Mr. Houston, for the restoration of employment:

"The co-operation of government with the natural forces of recovery primarily through the removal of barriers existing in the flow of capital into enterprise.

"A government policy of encour-

WHERE HENRY FORD IS ENLARGING HIS "CAPTIVE" STEELWORKS: Panorama of Fordson works of Ford Motor Co. in Dearborn, Mich., suburb of Detroit. In the lower center may be seen the two blast furnaces, just beyond the slip where the two Ford iron ore carriers are unloaded. The steel plant, where the new semifinishing and finishing mills will be located, is at the left. The coke works is at the extreme lower right. Present annual capacity of the Ford steelworks is 375,000 tons of pig iron, 600,000 tons of steel ingots

agement to private enterprise with the assurance of opportunity to earn in the future a reasonable return upon invested capital.

"Encouragement to continued savings by millions of American investors and the investment of such savings in securities of American industry.

"Amendment of the securities act of 1933 and the rewriting of the national securities act of 1934 in such manner as to encourage the issuance and free exchange of industrial securities under reasonable and proper regulation without restriction to the capital needs of business.

"Recognition of the fact that the opportunity for recovery in employment lies primarily in the field of durable goods, that is, the processes of rebuilding the country. Until these processes are resumed in a normal way there can be no normal employment."

Seek Data on Quality

Other speakers wanted more complete information about quality of products, and urged establishment of standards to denote quality. One speaker of a radical tinge alleged that "the federal government, by the passage of the national industrial recovery act, has repealed the Sherman antitrust laws without repealing tariffs and patent laws and without making the transportation of goods a nondiscriminatory public service at a fair cost, and without ending private monopoly of natural resources and private banking."

Robert F. Vaughn,of the Louisville, Ky., board of trade, recommended the inclusion of Kentucky in the southern wage zone where wage differentials are written into codes.

A number of representatives of small manufacturing companies charged the codes in their industries favored the large manufacturers and hurt the smaller units.

On the other hand, G. M. Peterson, Cheney-Bigelow Wire Works, Springfield, Mass., protested against any attempt on the part of the administration to coddle small businesses merely because they are small; he felt that it is up to any company to demonstrate initiative and strength even though it is small.

New Capacity

FORD MOTOR CO. has confirmed the announcement in STEEL for Feb. 26, page 10, that it has decided to install a blooming mill and additional finishing mills, the contract going to the United Engineering & Foundry Co., Pittsburgh, with delivery probably in September.

Full details have not yet been announced, but the blooming mill is expected to be a 44-inch unit. There will be a continuous strip-sheet mill for hot rolling up to 48 inches, and a cold-rolling mill.

The continuous mill will supply, among other things, strip for frames. Fender stock, body panels and sheets for other purposes will be among the products of the cold-rolling mill. Estimated cost of the improvement is $10,000,000.

Current steel requirements for Ford cars, exclusive of the engine and other cast parts, are about 1200 pounds each. At the present rate of 4000 assemblies a day, this is 2400 tons daily, or at an annual rate of about 600,000 tons.

The present steel ingot rating of the ten Ford open-hearth steel furnaces is 600,000 tons a year, indicating that even with this additional finishing capacity considerable Ford steel must be purchased on the outside. Or it might indicate further expansion of raw steelmaking capacity. A Ford spokesman states that the objective is to make not more than 30 per cent of the company's requirements.

Ford last week was operating only four open hearths, but may have all ten on this week. Ford expansion denotes great confidence in the automobile market, also apprehension concerning steel supply.

¶Foreign developments of the week:

The Japanese are reported to have ordered eight rolling mills from a Pittsburgh manufacturer.

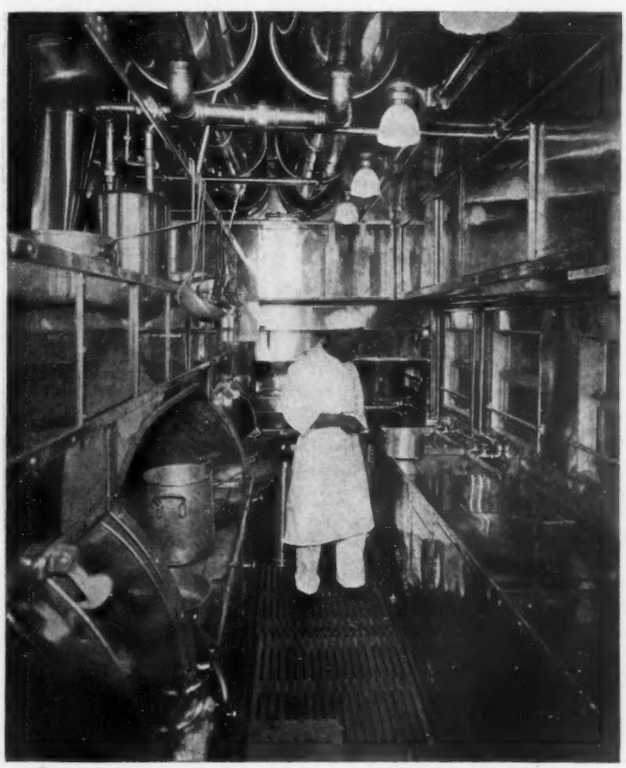
A representative of an American engineering interest is conferring in London with representatives of the Canton government of China relative to construction of a blast furnace and steelworks near Canton.

Soviet authorities are considering construction of an oil refinery at Moscow, and are in communication with American manufacturers of airplane engines on a $2,500,000 order.

¶Greer Steel Co., Dover, O., will install a modern 4-high cold strip mill. Authorization of the new unit to roll wide strip follows an announcement that it will discontinue production of narrow strip.

¶Tube Reducing Corp., 292 Madison avenue, New York, will establish a plant in the Pittsburgh district for the manufacture of mechanical tubing from ⅜ to 3½ inches in diameter.

¶Steel Co. of Canada Ltd., Hamilton, Ont., will enlarge its wire manufacturing department and construct an ingot mold building.



SPOTLESS TOWN ON WHEELS: The kitchen of one of four new diners of the Missouri-Kansas-Texas railroad made in the road's passenger car shops at Sedalia, Mo., are equipped with kitchen and pantry equipment of stainless steel made by the Republic Steel Corp., Central Alloy division, Massillon, O. The range, broiler, steam table and all lockers are of stainless steel, all tables are covered with it, and ice wells, refrigerator, water tanks and filter water tanks are lined with it. Four more of these units will be built

Meetings

CONCRETE REINFORCING STEEL INSTITUTE will hold its tenth annual meeting at the Edgewater Beach hotel, Chicago, beginning at 1 p.m., March 14, and concluding the following evening. This will be a business meeting for the discussion of problems before the industry in connection with its codes.

¶Grinding Wheel Manufacturers Association of the United States and Canada will hold its March meeting at the Mid Pines club, Knollwood, Southern Pines, N. C., March 15-16.

¶American Foundrymen's association in co-operation with Ohio State uni-

versity will hold a foundry conference and district meeting at Ohio State university, Columbus, O., April 5 and 6. Educational exhibit of foundry products and equipment will supplement a technical program and inspection of the university's engineering departments.

Financial

GRANITE CITY STEEL CO., Granite City, Ill., reports net profit of $506,652 for 1933, after all charges, compared with net of $13,827 in 1932. The profit for last year was equal to $1.99 a share on 254,992 shares outstanding, against 5 cents a share on 255,292 shares in 1932.

¶M. A. Hanna Co., Cleveland, reports net profit of $1,018,130, compared with earnings of $722,891 in 1932.

¶Chain Belt Co., Milwaukee, encountered a net loss, after all charges, of $106,234 in 1933, compared with net loss of $345,720 in 1932.

¶Otis Steel Co., Cleveland, March 1 made the third successive default on semiannual interest due on its 6 per cent bonds of which $10,827,500 are outstanding.

¶F. E. Myers & Bro. Co., Ashland, O., shows net profit of $83,267 for the quarter ended Jan. 31, compared with net of $31,248 in the same period last year.

¶Ludlum Steel Co., Watervliet, N. Y., reports net profit of $161,063 in 1933, after depreciation, taxes and other charges, compared with net loss of $474,310 in 1932.

¶Lamson & Sessions Co., Cleveland, reports a profit of $40,555 in 1933, compared with loss of $681,340 in 1932. Business continues about double the volume of a year ago, according to George S. Case, president. Directors were re-elected.

¶Crucible Steel Co. of America, Pittsburgh, reports net loss of $354,739 in 1933, compared with net loss of $3,613,615 in 1932. For the last six months of the year, the company showed profit of $670,022, contrasted with loss of $1,024,772 in the first six months.

¶McKeesport Tin Plate Co., McKeesport, Pa., reports net profit of $1,888,416 in 1933, equal to $6.29 a share. This compares with profit of $1,503,089, or $5.01 a share in 1932. Net sales of the company increased from $9,962,869 to $13,982,693 in 1933, the highest since 1930.

¶Meriam Co., Cleveland, has declared a 50 per cent stock dividend on undivided profits, evidencing, according to the company, that "well planned sales and advertising, plus sound financial standing can produce profits even during such disturbed conditions as existed during the recent depression."

Labor

UNABLE to persuade the Weirton Steel Co. to recede and co-operate in a poll to determine whether or not the Dec. 15 election for employe representatives was fully representative, as the company contends, the national labor board Thursday cited the case to the department of justice.

The specific charge against the company is that it has refused to abide by section 7a of NRA. If taken action against the company may be criminal proceedings on a charge of code violation, or an attempt to enjoin the company from interfering with another election.

The position of the Weirton company is that employes at the Dec. 15 elections voted overwhelmingly for representatives to bargain for them, and it disputes the contention of the Amalgamated Association of Iron, Steel and Tin Workers that the election was not democratic.

¶Testimony was taken by the national labor board last week on complaint of lodges of the Amalgamated association that its members are being discriminated against at the Great Lakes Steel Corp., Detroit.

¶A bill by Sen. Robert F. Wagner, New York, chairman of the national labor board, introduced Thursday, would prohibit organization of so-called company unions. Modeled after the railway labor act, the bill as explained by Senator Wagner, "forbids any employer to foster or participate in or influence any organization which deals with problems that should be covered by a genuine labor union * * * The new bill makes it clear that section 7a was not intended to ban closed union shop."

The Wagner bill sets up a permanent national labor board with two representatives of employers, two of employes and three of the general public, with provisions for regional or local boards, and enforcement through the courts in the same manner as orders of the federal trade commission.

¶The revised plan of employe representation proposed 10 days ago by the Carnegie Steel Co. was being voted upon last week by mill employes of not only the Carnegie company but also other United States Steel Corp. subsidiaries in the Pittsburgh district. STEEL last week, page 11, told how the revision of the plan reflects a liberalized attitude by the management.

This revised plan was ratified by the following votes at Carnegie divisions: Clairton, 2550 for, 736 against; Duquesne, 1850 for, 748 against; Edgar Thomson, 1705 for, 1076 against; Mingo, 806 for, 194 against; Isabella and Lucy furnaces, 242 for, 63 against; National Tube at McKeesport, 3194 for, 1643 against.

¶More or less mechanical was the signing last week of pacts with the United Mine Workers by Jones & Laughlin Steel Corp., Republic Steel Corp., and Inland Steel Co., covering wages and working conditions in the western Pennsylvania "captive" coal mines. These independent steel producers followed the precedent established the week prior by United States Steel's coal and coke subsidiary, H. C. Frick Coke Co.

Pacts and their terms were identical with those negotiated by H. C. Frick Co. and the United Mine Workers (STEEL, Feb. 26, pp. 11 and 12.) Each of the steel companies will adhere to the open shop policy of operation, but the agreement provides for the checkoff of union dues for union miners.

¶Sheet and tin plate workers' wages in mills having contracts with the Amalgamated Association of Iron, Steel and Tin Workers will be unchanged for February and March. The average selling price of Nos. 26, 27 and 28 gage sheets in January and February was reported as 2.47c, at the bimonthly settlement last week. The arrangement whereby the employes receive 15 per cent more wages than called for by the contract continues in effect.

Institute

WITH a few minor exceptions, iron and steel sellers generally have opened books for the second quarter at unchanged prices.

¶Important producers in the Chicago and Pittsburgh districts have refiled former quotations on hot-rolled strip, effective at once, restoring the Pittsburgh price of 1.75c and the Chicago level of 1.85c.

¶An advance of $2 a ton at Pacific ports, effective March 5, on bessemer or basic manufacturers wire to 2.65c and on high carbon spring wire to 3.65c has not extended to other districts.

¶Another Pacific coast port advance, effective March 10, is annealed fence wire to 2.90c, and in galvanized fence wire to 3.25c.

¶A price of $1.10, Pittsburgh, was recently announced on high speed drill rod, Class 2-A. Analysis calls for tungsten, and/or molybdenum, 6.50 to 9.50; chromium, 1.50 to 8; and vanadium, 0.20 to 0.80.

¶Effective March 11, new minimum prices on No. 24 galvanized rejects and galvanized wasters are 1.40c, Pittsburgh, and 1.50c, Gary, a reduction of $12 a ton on rejects and $7 on wasters.

¶Complete revision of lap-welded and charcoal iron boiler tube discounts and

of the standard commercial seamless boiler tube schedule was made effective Feb. 1. Price advances average 10 per cent, the sharpest changes occurring in quantity differentials, these being arranged in five groups based upon tonnage.

¶Extension of the $36.37½ price on rails from March 1 to March 31 is accompanied by a tentative proposal to extend the delivery limit from June 30 to Aug. 31.

¶Producers of so-called Ford special sheets are filing new prices, canceling the recent $2 a ton reductions at Pittsburgh and Chicago.

¶Revisions and additions to its book of Uniform Extras and Deductions, effective March 2, are being distributed by the institute. The principal changes relate to the special quality extra for alloy steel, extras for size, shape and quality of rerolling billets for seamless pipe, extra for lock washer rods, quantity extras on hot-rolled strip for delivery in the South, extras for engineering, and extra on pipe for structural purposes.

Foreign Trade

JANUARY exports of iron and steel products from the United States totaled 178,023 gross tons, a slight reduction from the 184,585 tons shipped in December, but more than triple the exports of 56,720 tons of January, 1933. January imports at 22,653 tons compare with 31,310 tons in December, and 21,892 in January, 1933.

¶The English steel industry faces a scrap shortage of approximately 1,000,000 tons, Sir Arthur Balfour said last week in speaking before the Bond club of New York.

¶Paralleling the remarkable increase in demand for containers in the United States in 1933, when 12.25 per cent of all steel was consumed by this classification, British output of cans last year totaled 120,000,000, a new record. More than 90 per cent of the tin plate requirement was supplied by British mills.

¶Iron and steel division, department of commerce, Washington, reports an inquiry from Japan for strip steel for making bicycle chain lengths, from Shanghai for wire rope and cable, and from Istanbul, Turkey, for steel gas and water pipe.

NRA

CODE hearings scheduled: March 9, dairy equipment manufacturing, vitreous enameled ware and liquid fuel appliance manufacturing industries; March 12, air valve industry; March 13, corrugated rolled metal culvert industry.

They Say:

REHABILITATION of industry is the forgotten purpose of NRA. Rehabilitation requires earnings, and prices. Prices must be higher than costs. This is granted grudgingly in the iron and steel, coal and some other codes. Rehabilitation is defeated by selling below cost. NRA ignores the promise of relaxation of the antitrust law. Industry suffers and since industry is our people all lose when industry loses"—J. H. Redhead, president, Lake City Malleable Co., Cleveland.

¶"That a man of no extraordinary experience prior to his (President Roosevelt's) acceptance of his present great responsibilities could acquire in so short a time such a national standing and relationship is an outstanding historical event. There must, of course, be many reasons for it as confidence is not a human equation easily or quickly obtained by individuals or groups."—George M. Verity, chairman, American Rolling Mill Co.

PRACTICES WHAT HE PREACHES: E. T. Weir, fighting chairman of the National Steel Corp., who is resisting encroachment of the national labor board at his Weirton subsidiary, appealed "for that courage that will stand up and defend the principles in which we believe and for an insistence on that free and independent expression of opinion which has been one of the great fundamental principles of our democracy" before the Engineering Society of Western Pennsylvania, Feb. 27. Unemployment insurance and old age pensions he approved, but not before careful study and analysis. "The greatest fallacy which has ever been preached or offered to man is that of employment through radical action. . . . There must be a limit to the point at which our condition can be improved by the reduction of working hours. . . . No civilization has ever progressed or been beneficial to the great mass of people that has been controlled by a dictator"

¶"The theory that workmen must be paid wages adequate to purchase the total production of all employment is essentially erroneous, as generally stated, in that it ignores the very large aggregate of buying power existing outside of wages received, and the important items of production cost other than wages paid."—George H. Houston, president, Baldwin Locomotive Works.

Production

AFTER advances of 3 to 4 points a week since late January, steelmaking operations improved only 1 point to 48 per cent in the week ended March 3. Recessions in the Youngstown and New England districts almost offset gains in the Pittsburgh, Wheeling and Cleveland districts. Indications are for a further slight rise this week.

Chicago: Unchanged at 44 per cent, with further gains in specifications pointing to rising output over coming weeks. Ten of 36 steelworks blast furnaces are active, with one merchant stack scheduled to go in blast shortly.

Pittsburgh: Advanced 3 points last week to 31 per cent. Improvement in the rate of a leading producer here accounted for the lift. Out of 60 steelworks blast furnaces, 18 are now in blast with individual rates as follows: Carnegie Steel Co., 9 of 32; Jones & Laughlin Steel Corp. 3 of 11; Bethlehem Steel Co. 2 of 7 at Johnstown, Pa.; National Tube Co. 1 of 4; and the following 1 of 2 each: American Steel & Wire Co., Pittsburgh Crucible Steel Co. and Pittsburgh Steel Co.

Youngstown: Declined 2 points last week to 52 per cent, but the rate is expected to rebound to 55 per cent this week. Some sheet and strip mills are booked solid for more than two months, and a bessemer plant is expected to resume March 5. Fifty out of 83 open hearths are melting.

Detroit: Unchanged at 79 per cent as 12 of the 18 open hearths in the district continue on. Ford is expected to increase production sharply this week, perhaps operating all ten open hearths, which would put the district's rate up to 100 per cent.

New England: Off 14 points unexpectedly to 65 per cent last week, one steelworks taking off all but one furnace and operating at 33 per cent. Four open hearths are now down in the district.

Central eastern seaboard: A fractional gain put the steel rate up to 30 per cent last week.

Wheeling: Following four successive weeks of unchanged ingot operations at 69 per cent, last week

showed an advance of 8 points to 77 per cent. In four district plants, 28 out of 39 open hearths are now active.

Cleveland-Lorain: Up 2 points to 79 per cent, National Tube Co., Lorain, putting on another open hearth, operating 11; Corrigan, McKinney Steel Co., continuing with 13, and Otis Steel Co., with 7. The latter is preparing to light another unit this week, when repairs are completed. It also has in operation three of its small open hearths at its Lakeside plant, and is preparing to light a fourth unit there.

Birmingham: Continuation of the 52 per cent rate of operations, and perhaps a slight increase, is assured by the receipt of further rail orders by the Ensley mill.

Buffalo: Holding at a fraction over 52 per cent, with producers making additional production units ready in case expected releases of rails are received. The present rate is 200 per cent greater than a year ago and will be continued, if not increased, toward the end of the quarter.

Toronto: Algoma Steel Corp. continues to operate its mills at Sault Ste. Marie, Ont., on double shift much of the time to maintain rolling schedules. Dominion Steel & Coal Co., Sydney, N. S., has banked a 550-ton blast furnace, leaving the Algoma stack at the Soo and the Steel Co. of Canada stack at Hamilton, Ont., the only two active in the Dominion.

St. Louis: Laclede Steel Co. has put on an additional open-hearth steel furnace, making three active. Granite City Steel Co. has three open hearths on, and Scullin Steel Co. and American Steel Foundries one each. Sheffield Steel Corp., Kansas City, Mo., also has three open hearths on. Tulsa Rolling Mill Co., Tulsa, Okla., has resumed and put on a furnace.

Colorado Fuel & Iron Co. expects to maintain its present activity at Pueblo, Colo., until July, largely through the accumulation of orders for rails.

February Iron Output Up 15 Per Cent; 4 Stacks Go In

AVERAGE daily production of coke pig iron in the United States made a gain of 15.3 per cent in February and carried the rate to the highest point since last September. This favorable showing was made possible by the 12 furnaces which had resumed operations in January and four more added to the total in February.

The average daily output of February was 45,426 gross tons, as compared with 39,537 tons in the preceding month, an increase of 5889 tons. The rate for last September was 50,264 tons. This was the best February production since 1931 with 61,114 tons. In February, one year ago, the rate was only 19,752 tons.

AVERAGE DAILY PRODUCTION

	1934	1933	1932	1931
Jan.	39,537	18,348	31,336	55,337
Feb.	45,426	19,752	33,122	61,114
Mar.	.....	17,484	31,194	65,448
Apr.	.....	20,786	28,524	66,986
May	.....	28,784	25,282	64,355
June	.....	42,165	20,867	54,599
July	.....	58,108	18,394	47,170
Aug.	.....	59,137	17,035	41,264
Sept	.....	50,264	19,788	38,947
Oct.	.....	43,824	20,795	37,831
Nov.	.....	36,124	20,858	36,727
Dec.	.....	38,456	17,650	31,625
Av.	42,331	36,223	23,699	50,035

Total production in February was 1,271,935 tons, an increase of 46,292 tons, or 3.78 per cent, over the 1,225,643 tons made in January. This gain is made more significant by the fact that February was only a 28-day month, compared with the 31-day month of January. The February total was the largest for any month since last October with 1,358,540 tons and was the best February production for any year since 1931 with 1,715,443 tons. In February, 1933, output was only 553,067 tons.

For the two months of this year, production has aggregated 2,497,578 tons, an increase of 1,375,726 tons over the 1,121,852 tons made in January and February of 1933. To find a better record, it is necessary to go back to 1931, when 3,426,635 tons of iron was made in two months.

Operating blast furnaces on Feb. 28 totaled 90, as compared with 86 on January 31. This was the largest number of furnaces active at the close of any month since last August, when 98 were making iron. Only 44 stacks were active at the end of February, 1933.

During February, 8 furnaces were blown in and 4 were blown out or banked. Of the nonmerchant or steelworks class, 7 resumed activity and none was blown out. Of the merchant class, 1 furnace was blown in and 4 blown out.

Relating production to capacity, the operating rate for February was 32.9 per cent, against 28.7 per cent in January. This was the highest rate of operations since last September with 36.4 per cent.

Furnaces resuming in February were: In Ohio: River No. 2, Corrigan, McKinney Steel Co.; Youngstown D, Youngstown Sheet & Tube Co. In Pennsylvania: Shenango No. 1, Shenango Furnace Co.; one Monessen, Pittsburgh Steel Co. In New York; Lackawanna B, Bethlehem Steel Co. In West Virginia: Riverside, Wheeling Steel Corp. In Illinois: South Works Old 1 and 2, Illinois Steel Co.

Stacks blown out or banked were: In Ohio: Jisco, Jackson Iron & Steel Co. In Pennsylvania: Neville Island, Davison Coke & Iron Co.; one Swedeland, Alan Wood Steel Co. In New York: Port Henry, Witherbee-Sherman Co.

FEBRUARY IRON PRODUCTION

	No. in blast last day of month		Total tonnage	
	Feb.	Jan.	Merchant	Nonmerchant
Ohio	24	23	61,997	325,492
Penna.	26	26	31,527*	294,625*
Alabama	10	10	52,851	67,020*
Illinois	6	4	12,352	76,528
New York	7	7	41,709	40,626
Colorado	1	1	.....	171,509
Indiana	5	5		
Maryland	3	3		
Virginia	0	0		
Kentucky	1	1	.....	95,699
Mass.	0	0		
Tennessee	0	0		
Utah	1	1		
West Va.	3	2		
Michigan	3	3		
Minnesota	0	0		
Missouri	0	0		
Total	90	86	200,436*	1,071,499*

*Includes ferro and spiegeleisen.

MONTHLY IRON PRODUCTION

	1934	1933	1932
Jan.	1,225,643	568,785	971,437
Feb.	1,271,935	553,067	960,550
T'l 2 mos.	2,497,578	1,121,852	1,931,987
Mar.	.....	542,013	967,015
Apr.	.....	623,606	855,734
May	.....	892,326	783,769
June	.....	1,264,953	626,015
July	.....	1,801,345	570,222
Aug.	.....	1,833,265	528,105
Sept.	.....	1,507,931	593,640
Oct.	.....	1,358,540	644,648
Nov.	.....	1,083,740	625,753
Dec.	.....	1,192,136	547,179
Total	.....	13,221,707	8,674,067

RATE OF OPERATIONS

(Relation of Production to Capacity)

	1934[1]	1933[1]	1932[2]	1931[3]
Jan.	28.7	13.3	22.1	38.4
Feb.	32.9	14.3	23.4	42.5
Mar.	.....	12.7	22.0	45.4
Apr.	.....	15.1	20.2	46.5
May	.....	20.9	17.9	44.7
June	.....	30.6	14.7	37.9
July	.....	42.2	13.0	32.7
Aug.	.....	42.8	12.0	28.7
Sept.	.....	36.4	14.0	27.0
Oct.	.....	31.8	14.7	26.3
Nov.	.....	26.2	14.7	25.5
Dec.	.....	27.9	12.5	22.0

[1]Based on capacity of 50,313,975 gross tons, Dec. 31, 1932; [2]on capacity of 51,598,175 tons; [3]on capacity of 52,515,875 tons. Capacities by American Iron and Steel institute.

WINDOWS OF WASHINGTON

Complaints Roil Atmosphere

• • •

Union War Chest Swelling

• • •

See More Steel in Homes

WASHINGTON

IT WOULD have been tough on the natives but far better for business men arriving for the NRA code meeting beginning Monday if a stiff northeaster had ripped in from the Atlantic over the week-end and cleared the Washington atmosphere of the criticism and dissatisfaction and complaints vented at last week's preliminary hearing.

Parlor pinks ranting at business in general; professors contending for pitiless publicity for manufacturers' costs in order to protect the consumer and labor; a governor's wife attacking steel executives and waving the firebrand that NRA, afraid of big business, is picking on "the little fellow"; economists expressing great concern for consumers in general—it was a field day for malcontents and theorists.

This week's developments may prove that letting off steam prior to the big code meeting was smart politics, but it created a depressing atmosphere into which the first contingents of code authorities and business men moved.

There was the sense that business was very much on the defensive, that it would be called upon for further sacrifices in the way of hours and wages, that radicals were perched like a wildcat in a lower bough waiting to spring on all pricing arrangements, that congress was in a mood to withdraw the truce on the anti-trust laws.

These early arrivals not only entered an atmosphere already heavily charged but they also made their contribution in the way of a rather general unsettled feeling concerning business. The country over, a slight reaction has been detected in the past days, a trough in the upward sawtooth of recovery.

Some of this uneasiness is traceable to apprehension that manufacturers would be subjected to higher costs with no immediate possibility of recouping them. In other words, they would again be caught between the pincers of labor and the consumer.

So, it is in a rather grim mood that business men and code authorities assemble Monday to listen to opening addresses by the President and NRA Administrator Johnson. So far as known, no previous President has addressed upward of 7000 executives—which was the preliminary estimate—in an effort to further regiment then.

Thus far the White House supply of rabbits has been inexhaustible, and another may be pulled out of the hat Monday, but the trick is beginning to pall.

LABOR, like business, was not on last week's agenda but General Johnson's plank for shorter hours and higher wage rates swells the undercurrent that as the recovery process proceeds labor is going to be a hard customer.

When such administration insiders as Secretary Perkins and General Johnson indicate that hours of work must be dealt with through codes and not by a congressional fiat, that makes a favorable report on the Connery 30-hour bill superfluous. It won't pass, but it will make the 36-hour week appear the more attractive as an alternative measure when it is proposed by General Johnson.

The action of the national labor board in passing the Weirton case along to the department of justice for action, and the further step toward a poll of Budd employes in Philadelphia, combined with a receptive ear to complaints against the Great Lakes steel mill at Detroit, which is allied with Weirton, foreshadow a more positive stand in Washington on behalf of labor.

The pressure for outlawing company unions is being counteracted by a liberalization of the plans already in effect at many steelworks. But when the Amalgamated Association of Iron, Steel and Tin Workers reports the formation of lodges in plants of the Carnegie Steel Co. and other United States Steel Corp. subsidiaries where it has not been active in 40 years, or since the Homestead strike, it connotes action. Altogether, about 125 new lodges are claimed by the Amalgamated.

Meanwhile, the war chest of organized labor is piling up. The present membership of the American Federation of Labor is more than 4,000,000, of which approximately 3,000,000 are paying dues. John L. Lewis' United Mine Workers to the tune of over 300,000 are paying national dues of $1 per member per month, or at an annual rate of over $3,500,000.

TO THE manufacturer reading of recent automotive strikes, contending with organization work in his own plants and feeling the pressure of Washington, it appears that everything favors labor. But labor has its own troubles, some of them very grievous.

Especially vexing to the American Federation of Labor at this time is the agitation within its ranks for vertical instead of craft unions. Thus far the movement has been kept within the control of officials of the federation, but the agitation is pronounced.

For instance, instead of organizing rollers and helpers and electricians and other well-defined groups of employes in a steelworks in separate unions, those advocating vertical organizations would enroll all employes of a plant in one big union.

One of the chief objections to vertical unions by some federation officials is that it prevents inter-company action. In other words, rollers in mills in the Pittsburgh, Youngs-

town and Cleveland districts could not take simultaneous action.

The same objection has been raised to so-called company unions, resulting in some discussion whether national organizations of company unions are feasible. Senator Wagner, chief of the NLB, has declared that he is more concerned with full freedom of company unions within a given plant than in an alliance among them

John P. Frey, secretary-treasurer of the metal trades department of the federation, a molder by trade, considered a conservative in the labor movement and the man who would guide steelworks labor if it were unionized, says on the subject of vertical unions:

"Since last summer we have been informed that a new type of labor organization has become necessary. Not only employers, but men occupying prominnt positions as industrial advisers, have publicly declared that international trade unions, as they have been developed under the American Federation of Labor, have outlived their usefulness. That a new type, a new form of labor organization is necessary to meet newer methods of production, and the changed industrial situation created by the industrial codes entered into under the NRA.

"Trade union officials are being told, by so-called industrial experts and advisers, that unless the American trade union movement can change its structure and form of organization to meet the new conditions set up, it will shortly be compelled to pass out of existence, and that newer men with newer ideas and a more practical understanding will take their place.

"There is nothing new in such statements. The leaders of the American Federation of Labor, 50 years ago, listened to the same expressions which came largely from the same type of individuals.

"But today the developing attack against the structure of the American trade union movement has a more sinister quality. The wish has been father to the thought. The present desire has its origin among those employers, who, believing that the labor guarantees of NIRA cannot be suppressed, hope to subvert them by having a type of labor organization created which will prevent their employes from acquiring that strength and informed purpose which comes alone through membership in International Unions.

"The so-called vertical union being urged upon American workmen by those outside of the trade union movement, and who profess to have a kindly interest in labor's welfare, is a hybrid, having the industrial form of union as a mother, but an unknown sire whose characteristics closely resembled a company union.

"It would split up existing international unions into comparatively small groups, each one an independent organization and having no national body through which the separate groups could function collectively. Under this form of organization labor would find itself in the position of separate states without a federal government, called upon to face a grave national problem.

"To a practical observer of the way things are done in the industrial world, the proposal to build up these so-called vertical industrial unions, is merely a present day application of the age old policy of dividing to conquer."

IT WAS stated last week that the increasing scope of the government housing program, to be financed in part by PWA, offered opportunity to the steel industry for the development of a large tonnage business in steel or part-steel houses.

It is learned that Kastner & Stonerov & W. P. Barney Associates Inc., Philadelphia, architects in connection with the housing group now under construction in that city for the Full Fashioned Hosiery Workers union, have several new housing projects now under consideration by other unions.

This firm, it is said, is investigating the possibilities of utilizing standardized, prefabricated steel sections for small homes. For instance, a bathroom with steel floor, walls and roof, with bathtub and other toilet facilities and complete piping all in place, is being considered.

Too, a plan for a standard steel kitchen, similarly complete, is receiving attention. In the same way, possibilities for a complete heating compartment, with furnace, are being scrutinized.

THE federal trade commission has become publicity conscious.

To everybody's surprise, the commission last week released the data it had collected on corporation salaries and bonuses instead of submitting the data to the senate, which had requested it. A number of corporations submitted information with the request it be considered confidential.

Last week the commission announced that it would make public at the time of issuance, instead of at the final determination, formal complaints by the commisison charging unfair trade practices or other violations of the federal trade act.

Last week, too, it went on record for publicity concerning cases settled by stipulation, usually minor infractions.

Efforts are being made in some quarters to have the trade commission designated to enforce NRA codes. Coupled with its present administration of the securities act plus possible regulation of stock exchanges, this would make the commission probably the strongest government agency.

In a few days the trade commission is expected to receive from its chief counsel the report on basing points and other price policies of the steel industry under its code, but it may be before the commission a short time before final action is taken. Judging by past performance, this report also will be broadcast.

The commission has also practically completed its report on the price basis of the range boiler industry.

Sees Era of Tailor-Made Steels

BELIEF that the steel industry is on the threshold of an era of special steel—tailor-made steels—which will take the place of much of the so-called "tonnage" of today was voiced by L. S. Hamaker, sales promotion manager, Republic Steel Corp., Youngstown, in an address before the Southern Association of Purchasing Agents at Birmingham, Ala., Feb. 13.

Mr. Hamaker outlined a new conception of the merchandising of steel. "It behooves all of us," he said, "to begin working out ways and means to serve a stable market, to induce it to absorb more of our product by making the product more serviceable, more attractive and more desirable. The relative scarcity of new consumers must be compensated for by raising the standards of living, by the development of new desires, new markets and new products."

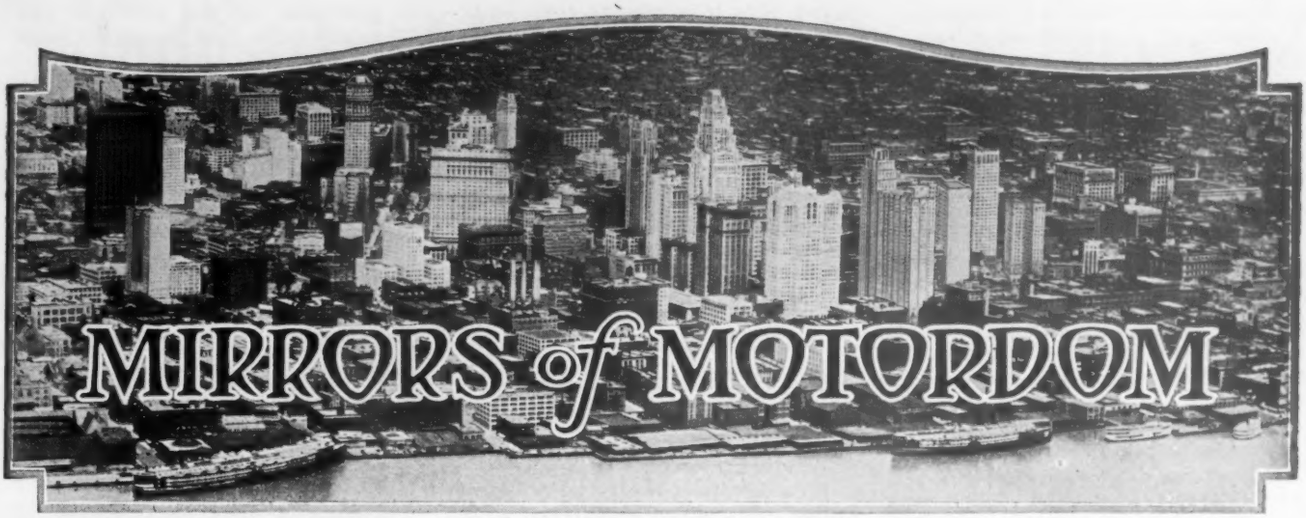
Indicating the difficulty of shifting to the new methods, he declared that "it is not easy for men raised in the school whose slogan was 'We make steel; come and get it,' to realize

(*Please turn to Page* 42)

Robins Gets Mead-Morrison Ore, Coal Handling Lines

Robins Conveying Belt Co., New York, has acquired the coal and ore handling business of the Mead-Morrison Mfg. Co., Boston, to be operated as the Mead-Morrison division of the Robins company. This consolidation gives the Robins company a complete line of material handling machinery.

The Mead-Morrison office in New York has been closed and its personnel moved to the Robins office at 15 Park Row, New York. Many members of the Mead-Morrison staff have been taken into the Robins organization, including Messrs. Brooks and Youngberg, of Chicago, and Donahue, Snow and Brown, of Boston. Equipment is being moved from the Mead-Morrison plant at East Boston, Mass., to the Robins works in Passaic, N. J.



Economy Car for Chevrolet

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Labor Trouble Less Acute

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14-Foot Sheets for Bodies

DETROIT

NOW that Chevrolet has licked the severe production problems created by the adoption of knee-action wheels and the changes they entailed in front end and frame design, it is turning to its second line.

Stressing economy and designed primarily for fleet buyers, this line will have orthodox semi-elliptic leaf springs in front and a front axle, like the 1933 Chevrolet. It also will lack some of the gadgets, bright work and body features of the regular series, and be priced about 10 per cent lower.

More than a year ago Chevrolet introduced its second line, originally expected to be called the Mercury but actually chistened Standard to distinguish it from the master series. However, the times were against fleet buying, and the line was not pushed vigorously.

But with the recovery in business appearing to be the real thing, Chevrolet will again make a drive for fleet sales. Originally it planned to bring out this economy series about March 15, but delays have intervened and a later date is probable.

Not often enough to be a deterrent to sales, as actual orders evidence, but sufficiently often to make dealers sensitive, objections to coil springs have been cropping out, chiefly from mechanically-minded prospects who prefer "letting someone else do the experimenting the first year." Equipped with a series with "regular" springs, Chevrolet dealers will shortly be in position to counter this sales resistance.

Chevrolet engineers also will be able to check in actual service the perfor ıance of their new higher-powered engines in what might be termed a standard chassis. Despite all the ballyhoo, final judgment has not yet been rendered on coil springs.

Chrysler engineers, it will be recalled, learned that the action of coil springs in their new streamlined DeSoto and Chrysler series was not enough superior to leaf springs to warrant the additional cost. Within three years, it is safe to predict, some cars will mount their engine over the rear axle, introducing still another complication in springing.

This new Chevrolet, incidentally, will not complete General Motors' expansion plans for 1934. There is the small Buick, just in the offing, and Pontiac has more than experimental interest in a small model which may be inserted between Pontiac and Chevrolet.

Other makers to bring out new lines in the spring include Reo and Auburn. Hudson-Terraplane will widen its body choices. Hupp may offer the lowest price car in its history.

CROSSING 4000 units a day, Chevrolet last week virtually caught up with Ford. When automobile history is written it will record that the Chevrolet production effort on the 1934 series, starting from scratch in late December and attaining a 4000 daily rate by late February, was phenomenal.

It still is the case with Chevrolet that its only limitation for the first half of 1934 is the assembly line. Last week's production was at the rate of 80,000 to 85,000 units a month; for March the goal is 95,000 to 100,000.

Ford, not pushing ahead so rapidly as in January owing, for one thing, to the fact that Chevrolet and Plymouth are catching up, also will make close to 100,000 units this month. The big effort at Fordson is to step up the output of cast alloy crankshafts and increase the proportion of cars so equipped from one half to two thirds.

Plymouth now is shipping about 8000 units a week, or at the rate of 35,000 a month. The "big little three," thus, probably will conclude March with a total of about 230,000 units. Hudson-Terraplane has scheduled 18,000 for this month, Pontiac 20,000, Buick 10,000, Graham 3000, Olds eight 5000, Dodge, DeSoto and Chrysler about 35,000.

Willys-Overland last week released a few small orders for steel for the 5000 to 7000 cars it will build following a special court dispensation to the receivers. As noted last week, some Chrysler parts are made in the Willys plant at Toledo and shipped to Detroit.

Unofficially, it can be said that those still interested in Willys hope to sell enough equipment to provide funds for making enough cars this year to clear up most of the indebtedness. In certain sections, the streamlined Willys is in good demand. Chrysler may be found the eventual buyer of some Willys plants and subsidiaries, including the foundry division at Pontiac.

AUTOMOBILE manufacturers had a pronounced case of gooseflesh a week ago when the automobile workers' union "pulled" their members at parts plants in Toledo, O., and at the Nash and Case plants at Racine, Wis.

A 5 per cent advance in wages, plus more or less recognition of the union in the form of dealing with shop committees ended the trouble at Toledo. The union has penetrated most automobile and parts plants in Detroit, Flint, Pontiac, Lansing and other automotive centers of Michigan, but with no present indication of disturbance.

If immunity could be purchased with a 5 per cent pay rise, some manufacturers would be glad to buy it. Now, as last winter when the die and tool makers' strike occurred, Flint is the hotbed of unionism and is being watched to give the first sign of trouble.

At the moment, the principal effect of labor difficulty on production

is the scarcity of recalled skilled men. A surprisingly large number of men, dissatisfied with the sporadic employment conditions of the past three or four years, have returned to Michigan farms. The prospect being dangled before automotive labor is that it will be able to earn as much this year as in 1929.

IMAGINE an automobile body stamped from only two sheets! Plans that some Detroit body plants have for 1935 indicate that the coming automobile shell of only a year hence will be stamped in two pieces, instead of the present build-up of five and six panels per side, each requiring a separate sheet.

About ten days ago engineers of one of the leading automobile body plants at Detroit proceeded so far with this idea as to take it off the drawing boards, issue trial sheet specifications and orders, and now plans for immediate experiments.

To conform to their idea, the sheets ordered are in 84-inch widths, but 170 inches long! Deep drawing stock is of course specified No. 20 gage cold-rolled.

Sheet mills probably will have nightmares for months thinking of how they will roll a 7-foot wide sheet 14 feet long. And sheet mills will not only be required to roll to this 14-foot length—which is something they have never been asked to do before—but they must keep their No. 20 gage sheet 0.0368-inch in thickness, on which they are allowed only a 0.005-inch tolerance.

One body plant placed at least 15 tons of these sheets last week for experimental purposes. What the sheet steel mills will do when heavy tonnages of this extremely exacting specifications start to be the common thing is something to think twice about.

Like the two halves of an oyster, models for 1935 will be stamped and assembled in a jiffy—simply one full-length right stamping and one full-length left stamping will be welded across the center of the hood, over the middle of the top and down the back!

Next year's bodies will be stamped out by use of only two dies. One die will be for the car's right side; the other for its left. Each die will start with the front fender, take in the side panels, quarter panels, and the rear fender. Plans for extensive and costly redesign of presses are under way. Body plants are also thinking of the intricate dies they will need.

GRAY iron foundries stand to benefit from the big rise in the cost of aluminum. When Ford and other manufacturers adopted aluminum cylinder heads, because they dissipate heat faster and permit higher compression ratios, No. 12 remelt aluminum was 7 to 8c per pound. Now it is 16c. At 4000 units a day, Ford is using 3,000,000 pounds of aluminum a month . . . . Detroit would not be surprised if White Motor, at Cleveland, broke away from Studebaker. Reports last week were that American Car & Foundry Co. was angling for it . . . . Further evidence that Henry Ford is mellowing: He not only has approved President Roosevelt and NRA but also is offering a special line of trucks for the liquor industry . . . . Eaton Mfg. Co., Cleveland, will offer a "fluid flywheel" transmission for 1935 models; this is akin to the automatic gearshift . . . . Eaton last week booked an order for valve seat inserts for Citroen, the big French automotive interest.

(For details of the new Ford steel rolling mills, which STEEL last week was first to announce, see p. 11)

Died:

FRANK R. DRAVO, 67, president and director of Dravo Contracting Co., Pittsburgh, in that city, Feb. 26, from injuries in a train wreck. He was also a director in the following companies: Charleroi Supply Co., Dravo-Doyle Co., Dravo Equipment Co. and Inland Rivers Wharf Co., and was a vice president and director in Keystone Sand & Supply Co.

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Charles I. Gibson, 56, general manager of the Guernsey plant of the American Sheet & Tin Plate Co. at Cambridge, O., in that city, Feb. 28.

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E. L. Butler, 37, vice president, Southern Steel Co., Birmingham, Ala., at his home there, Feb. 24. He was widely known among southern structural steel interests.

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W. D. Mount, 67, consulting mechanical and chemical engineer, at his home in Lynchburg, Va., Feb. 28. For years he was managing director of all operations of the Mathieson Alkali Works.

□ □ □

Leander Whelan, 76, pioneer foundrymen of the South, in Birmingham, Ala., Feb. 14. In 1882 he took charge of the foundry at the Williams Iron Works, Birmingham.

□ □ □

Edward F. McElheaney, 58, assistant treasurer of the Central Foundry Co., New York, in a Plainfield, N. J., hospital, Feb. 17, after a short illness. He had been connected with the Central company for 32 years.

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John McDowell, 73, until his retirement in 1931 superintendent of the Morris, Burt, Sellers, Pool, Philpin and Winnifred mines of the Oliver Iron Mining Co., in Hibbing, Minn., Feb. 13, after a three-year illness. At one time he was employed as machinist in the shops of the Cleveland-Cliffs Iron Co. at Ishpeming, Mich.

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Walter Bowne Beebe, 57, retired president of the Northwest Steel Co., Portland, Oreg., in Portland, Feb. 23. Born in New York, he had lived in Oregon since 1884, co-operating in the organization of the Northwest company in 1902.

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David C. Morrow, 57, president and general manager, United Iron Co., Inola, Kans., at his home in Tulsa, Okla., recently. He was also a vice president of the Joplin Machine & Electric Co., Joplin, Mo., and of the Inland Iron Works, Okmulgee, Okla.

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Fred Wild, 75, at one time freight agent and traffic manager for the Colorado Fuel & Iron Co., in Denver, Feb. 17. Following his association with this company he became vice president of the Denver & Rio Grande railroad, retiring four years ago.

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Harry A. Neeb, 83, prominent in Pittsburgh business circles and one of the original backers of the old Vanadium Co. and Flannery Bolt Co., both of Pittsburgh, in that city, Feb. 27. He was also the first treasurer as well as a director of both these companies.

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Robert Ramsay, 65, at one time superintendent of three of the H. C. Frick Coke Co. plants in the Pittsburgh district, in Birmingham, Ala., Feb. 21. Early in his life he was superintendent of the Stonega Coal & Coke Co., Stonega, Va., and from 1901 until his retirement last year he was superintendent of four Pittsburgh district Frick company plants.

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Michael M. McIntyre, 75, founder in 1906 of the Perfection Spring Co., Cleveland, later the Eaton Axle & Spring Co., in Cleveland, Feb. 28. Charter member of the Society of Automotive Engineers, he was said to be responsible for the introduction of Krupp steel for automobile springs in this country. He was chief spring engineer of the company when he retired five years ago.

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Frederic B. Stevens, 78, founder and president of Frederic B. Stevens Inc., Detroit, foundry equipment and supplies, at his home in Detroit, March 1. Born in Canton, Conn., he removed to Detroit in 1876 and was employed by the Detroit Stove Works. At the age of 27 he began business for himself, handling foundry facings and supplies. In Detroit he was recognized as a leader in industrial, financial, social, religious and Masonic life. He held a high office in the latter order. Among his numerous directorships was that in the Michigan Valve & Foundry Supply Co.

Industrial Men in the Day's News

John Lloyd, Assistant Superintendent, Edgar Thomson Works, Carnegie Steel Co.

Wealth of 35 years' experience in the rolling of steel is his, all spent with the Carnegie company.

Starting at the Carrie furnaces, he was blueprint boy, later a tracer, and finally draftsman.

Without college education, he graduated from the ranks of practical steelmakers to his new position.

JOHN LLOYD, new assistant superintendent of the Edgar Thomson works, Carnegie Steel Co., Pittsburgh, counts his years of experience in the rolling of steel back to May of 1899. He has been with the Carnegie company throughout his entire career.

Similarly to many other operating executives, he first was employed at the company's Carrie furnaces. He began there as a blueprint boy and subsequently was a tracer and draftsman until 1902, when he was transferred to the Mingo Junction, O., works of the company. However, his tenure there was brief and he went to the works of which he is now assistant superintendent, in July, 1903.

His experience then broadened and after service as a draftsman he became a roller on No. 3 mill, then mill foreman, and in 1923 was promoted to superintendency of the works' rolling mills.

He held that position until his recent appointment as assistant to Frank F. Slick, in charge of the entire steelworks and rolling mills.

Mr. Lloyd is a resident of Pittsburgh and in his earlier years, although he attended no institution of higher learning, had special education in chemistry and mathematics.

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Reese H. Taylor has been reelected president of the Consolidated Steel Co., Torrance, Calif. Other officers include: Vice presidents, John A. McCone, G. J. Carroll and D. G. Henderson, the latter to serve also as treasurer; secretary, L. C. Rollins; and assistant secretaries, R. O. Cragin, H. C. Cranfill and D. W. Giegerich. Board of directors has been reduced from 20 to 15.

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Frank A. Nealon has been appointed genera' sales manager of the American Enameled Magnet Wire Co., Port Huron, Mich. He was formerly sales manager for the Sterling Cable Co., both of these companies being divisions of the Electric Auto-Lite Co., Toledo, O.

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Edwin L. Grimes has been appointed district manager for the recently-opened Detroit office of the Patterson Foundry & Machine Co., East Liverpool, O., located at 406 Basso building, 7338 Woodward avenue.

Louis H. Burkhart Jr. has been chosen to handle territory in northern New York state and western Pennsylvania, with headquarters at Corry, Pa.

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Everett Chapman, since 1930 director of engineering and research for Lukenweld Inc., division of Lukens Steel Co., Coatesville, Pa., has been named vice president. He has been credited with responsibility for this organization's achievements in the application of welded steel construction to diesel engines, presses, planers, lathes and other equipment. Articles by Mr. Chapman on the design of welded joints were published in STEEL, Aug. 28, Sept. 11, Dec. 11 and Dec. 25, 1933.

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David Adams has been appointed Pittsburgh district sales manager of the Falk Corp., Milwaukee, succeeding W. O. Beyer, who recently resigned to become a member of the Pittsburgh civil service commission. Mr. Adams has been with the Falk Corp. for the past four years in the sales department at Milwaukee and previously had been with National Malleable & Steel Castings Co., Sharon, Pa., and W. A. Riddell Co., Bucyrus, O., in charge of foundry and sales.

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Franklin Farrel Jr. has been reelected chairman of the board of directors of Farrel-Birmingham Co. Inc., Ansonia, Conn. Other officers re-appointed are: President, Nelson W. Pickering; vice presidents, David R. Bowen, Carl Hitchcock, Franklin R. Hoadley and Armin G. Kessler; treasurer, Frederick M. Drew Jr.; assistant treasurer, Laurie K. Blackman; secretary, George C. Bryant; and assistant secretary, William B. Marvin.

Leslie B. Worthington

Who as announced in STEEL for Jan. 22 has been appointed assistant manager of the Chicago district sales office of the Illinois Steel Co.

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D. L. Bennett, assistant traffic manager and traffic counsel for the Wheeling Steel Corp., Wheeling, W. Va., has resigned after three years' service to open his own office, handling traffic cases. For over 10 years he was with the Whitaker-Glessner and By-Product Coke companies at Portsmouth, O.

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Dr. Lewis B. Stillwell, consulting engineer, New York, has been award-

(*Please turn to Page* 66)

EDITORIAL

Government by Defamation Will Not Succeed

AFTER a full year of Roosevelt administration, industry now is in a position to review its policies toward business and finance and to draw certain conclusions on the basis of actual experience.

There is no question but what the two dominant motives in the "new deal" are recovery and reform. Much of the President's popularity during his first year in office is due to the fact that the public—including the great majority of industrial executives—is heartily in accord with these two objectives. Practically every one agrees that government policies should be directed toward aiding the country to shake off the grip of the depression. Also there is general agreement that certain abuses which contributed to our recent difficulties should be corrected. In other words, the President has broad support for his objectives—recovery and reform.

During the period when the new policies were being formulated, public opinion was based largely upon the merits of these objectives, and not to an important degree upon the methods employed to attain them. This accounts for the liberal powers granted to the Chief Executive last year and for the absence of substantial opposition to some of the radical experiments which were undertaken with government sanction. No people in the world would have permitted such deviations from orthodox methods unless they had abiding faith in the objectives sought.

Approve Objectives, But Not High-Handed Methods Employed in Administration

But as time went on, the methods were subjected to closer scrutiny by discerning minds. This was particularly true in the case of phases of government administration which affected industry. It is probably safe to say that industry accepted NRA largely on faith—on a hope that it could be made a valuable agency for eliminating some of the abuses of cut-throat competition and that at the same time it would continue and expand the spreadwork idea which already had been adopted by hundreds of companies. Industry accepted the idea in spite of the fact that it seemed to embrace social and economic reforms of greater magnitude than could be assimilated in a brief time. In brief, industry co-operated with the government to an amazing extent in spite of serious misgivings as to certain parts of the program. Stated another way, it yielded on many dubious points in the hope that the main objectives might be attained.

In view of what has happened in recent months many conscientious business men have been forced to wonder whether they were right in accepting so much of the government's prescription on faith. The President and his advisers seem to have adopted a dangerous philosophy in regard to the relation of government to business. It is the philosophy of "cracking down" on an entire industry in order to get at the minority which has been guilty of misconduct. It is the philosophy of ruthless destruction, of lynch-law for business.

Present Policies Show Little Concern for Rights of "Fair-minded 90 Per Cent"

It was this philosophy which prompted the deplorable cancellation of air-mail contracts, an action inflicting undeserved hardship on numerous industrial companies which had no opportunity for participating in the questionable handling of air mail contracts.

One could name many other instances where the government has exposed certain practices of the minority in such a way that the public jumps to the conclusion that they are applicable to everyone in the industry.

It is difficult to reconcile this policy of indiscriminate defamation with President Roosevelt's earlier statements. Last spring he alluded frequently to the minority offenders and to the integrity of the majority. In his radio address of May 7 he referred to the "fair 90 per cent" in the textile industry who were guided by proper motives and to the "unfair 10 per cent" who would exploit labor.

We believe that the "fair 90 per cent" of any industry is entitled to more consideration than it has received under the present administration. We believe that a little more government publicity, appreciation and recognition of what the "fair 90 per cent" has done and is doing would stimulate recovery and reform more effectively than continued defamation of the 100 per cent.

THE BUSINESS TREND

Business Gains in Spite of Confusion in U. S. Policies

THE first anniversary of the advent of the "new deal" finds business optimistic over the outlook for early improvement but pessimistic over the trend of government activity in business.

Statistically the record of advance since last November and December is gratifying. The index of industrial production, which last fall declined to a low of 73 in November, has climbed back to 81 or 82, its estimated level for February. In other words, the index now is approximately where it was last May, when the nation was in the grip of the inflationary spurt which extended from April to July.

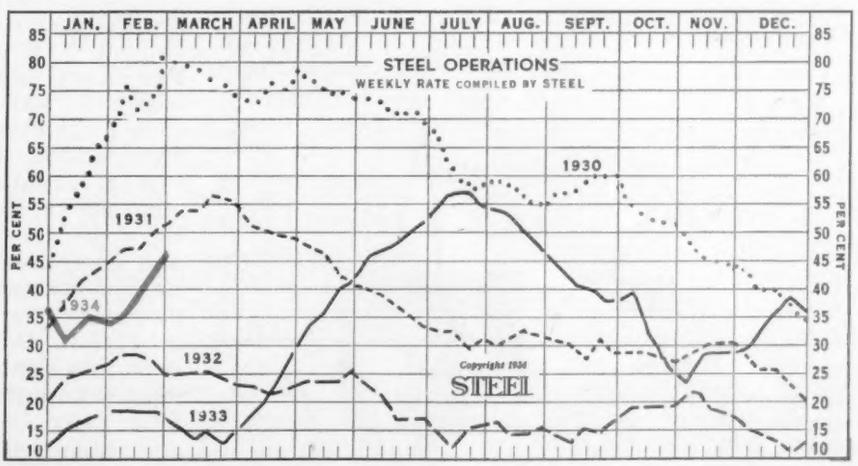
In relation to production, employment and payrolls in February were far more favorable than they were last May, indicating that the great pressure of the government through NRA and other agencies has altered appreciably the usual relationship between production and employment.

The weekly barometers are moving in the right direction. Power output is up sharply. Steelworks operations are approaching the 50 per cent mark—meaning that the steel industry early in March is in about the same position it occupied in mid-June last year, when it was still on its upward climb to the July peak. The curve of freight car loadings in February mounted clearly above the corresponding trend lines of 1932 and 1933.

In spite of these gratifying signs of general improvement, some divisions of the heavy industries still are lagging behind the procession. The impetus for recovery is poorly distributed.

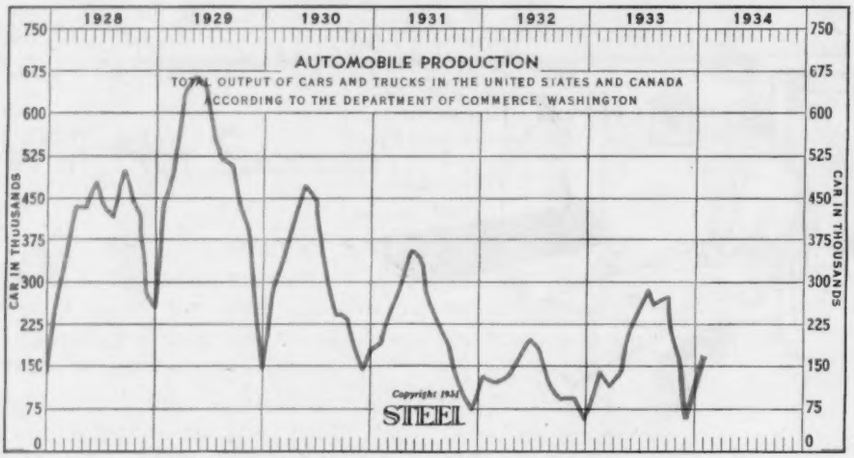
Clash of Conflicting Government Policies Retards Growth of Business Confidence

Another disconcerting factor is the unfortunate confusion arising from government attitude toward industry. The administration's efforts to curb abuses in high financial circles are disturbing all business—large and small—and are in danger of undermining confidence if they are continued much longer. A more determined attempt to discriminate between offending and innocent companies and individuals probably would relieve much of the confusion.



1934	
Feb. 24	47
Feb. 17	43
Feb. 10	39
Feb. 3	36
Jan. 27	33
Jan. 20	35
Jan. 13	33
Jan. 6	31

1933	
Feb. 25	17
Feb. 18	19
Feb. 11	19
Feb. 4	19
Jan. 28	19
Jan. 21	18
Jan. 14	17
Jan. 7	16



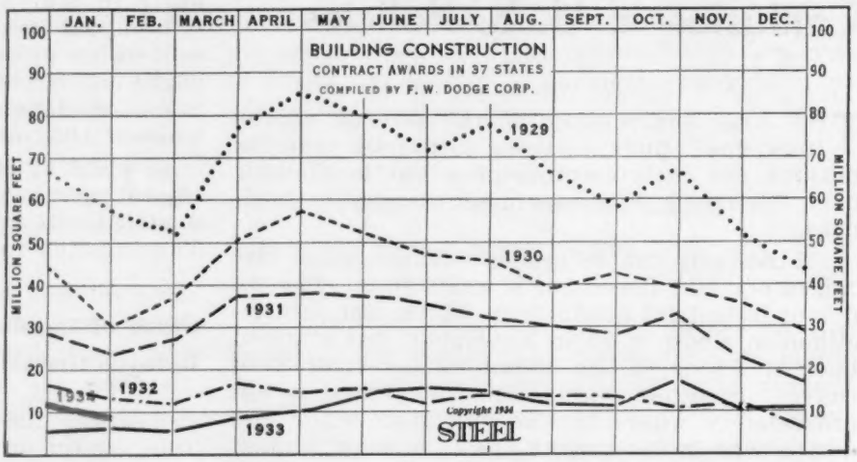
January, 1934	167,910
December, 1933	87,307
January, 1933	133,445

January Automobile Output Points to Higher Levels

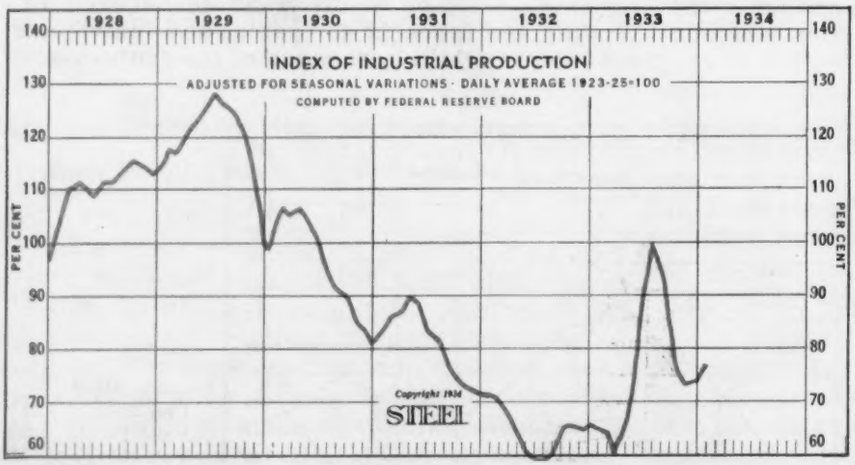
Production of passenger cars and commercial motor vehicles in the United States and Canada during January advanced 80,496 units. According to the report from the department of commerce, the January output totaled 167,910 units, compared with 133,445 units produced in January, 1933. The influx of orders for new cars continues strong and the momentum of the present forward movement in automobile production should be maintained throughout the spring and early summer months.

January Building Awards Show Slight Gain Over Year Ago

Building awards as measured in new floor space in 37 eastern states declined nearly 2,000,000 square feet in January. According to the report of the F. W. Dodge Corp., total construction for January involved 9,568,700 square feet as compared with 11,451,500 in December. In January, 1933 awards totaled 8,452,500 square feet. The valuation of contracts awarded during January, 1934, was $187,463,700 which compares with $83,356,000 in the same month last year.



	Square Feet
January, 1934	9,568,700
December, 1933	11,451,500
January, 1933	8,452,500



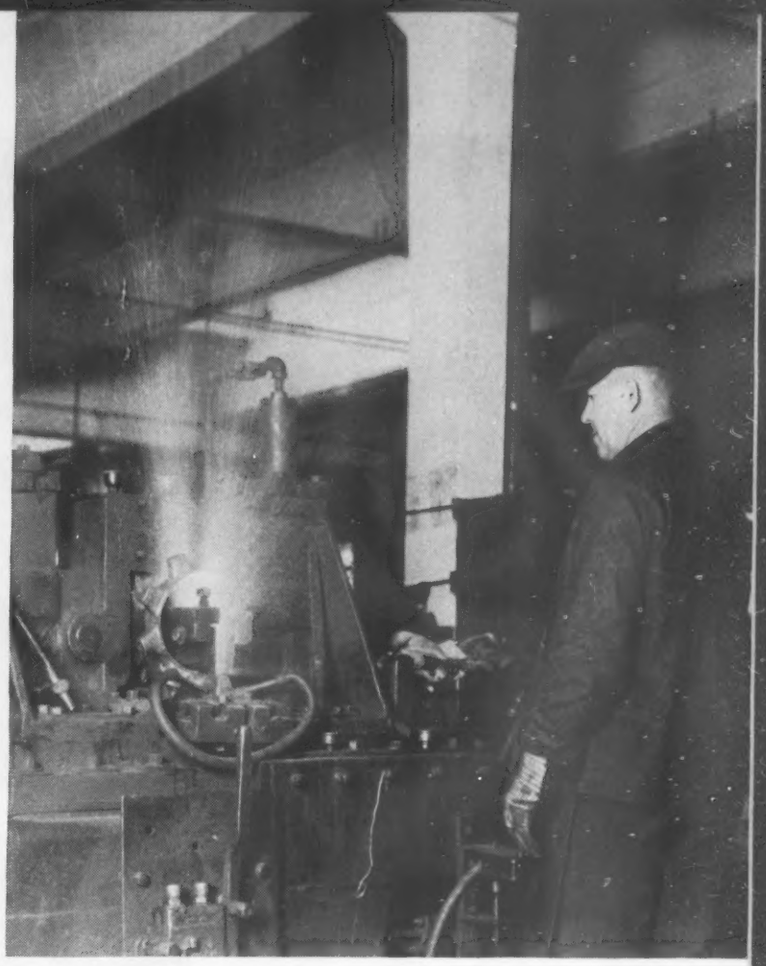
	Per Cent
January, 1934	78
December, 1933	75
January, 1933	65

Industrial Production Index Advances in January

Industrial production in the United States, as reported by the Federal Reserve board advanced 3 points in January. The index figure, adjusted for seasonal variation, was 78. This compares with 65 in January, 1933. In the manufacturing group, the iron and steel production index for January declined 5 points to 56 and compares with 30 in January a year ago. Factory employment remained unchanged at 71.8 in January, but shows a substantial gain over last year when the index stood at 59.4.

FULL SPOKE UNIT FOR WELDED WHEEL DRAWN FROM STRIP

BY A. H. ALLEN
Associate Editor, STEEL



COLORFUL shower of sparks accompanies the welding of each spoke spider. The unit is clamped in water-cooled electrodes, a high current dead shorted across the joint for a few seconds and a strong weld results

WHIRLING over the nation's highways, through mud and gravel; through snow, ice and salty slush of city streets; through salt spray of the ocean and sand storms of the desert, few parts of the modern automobile are subjected to such grueling service as are the wheels. In addition to resisting attacks of the elements, wheels also must supply strength to stand up under accidental shocks such as jamming against curbs and other vehicles. Furthermore, new cars are reported to average upward of 200 pounds heavier this year, additional weight which is necessarily distributed over the four wheels.

Thus, manufacturers of wheels have been revising their designs to attain simplicity of construction and to combat the dual problem of corrosion resistance and greater strength, a field in which steel is the logical choice for material. As in numerous other products where demands for strength and permanence are to be satisfied, steel has been given the call over wood and other materials.

Steel automobile wheels have been made for years in a number of different styles. Probably the first was the disk wheel, blanked and formed from a solid sheet of steel. Later this design was varied by punching out openings in the disk to simulate spokes. Artillery-type steel wheels with forged spokes have been used widely, and last year a one-piece stamped steel spoke wheel was a popular design on many cars. Probably one of the most widely used types of steel wheels is the wire spoke wheel, with spokes either welded or riveted to the rim. Mass production of both disk and wire spoke wheels was described in STEEL for Sept. 18, 1930.

Introduction of low-pressure balloon tires and the so-called air wheels has meant a decrease in the diameter required in the wheel proper, the latter factor permitting some interesting revisions in the method of manufacturing certain types of wheels. Cleveland Welding Co., Cleveland, has originated a new wheel design and has set up facilities for turning out several thousand daily. Rim and spokes are formed from strip steel, resistance welded in circular form and the spoke unit riveted to the rim. Chrome plating is applied to the spoke unit, while the rim is japanned and striped.

Spoke stock is received from the steel mill in hot-rolled annealed form, cut to size and in bundles. A typical analysis is 0.07 per cent carbon, 0.38 manganese, 0.010 phosphorus and 0.023 sulphur. Hardness ranges 35-45 on the Rockwell B scale For the 14-inch diameter (tire size) wheel, the strip is 4½ inches wide, 72 inches long and 0.093-inch thick. The 15 and 16-inch wheels use stock of the same thickness, size for the former being 4 21/32 x 84¾ inches; for the latter 4½ x 88 inches. These three wheels are formed with eight, ten and eleven spokes, respec-

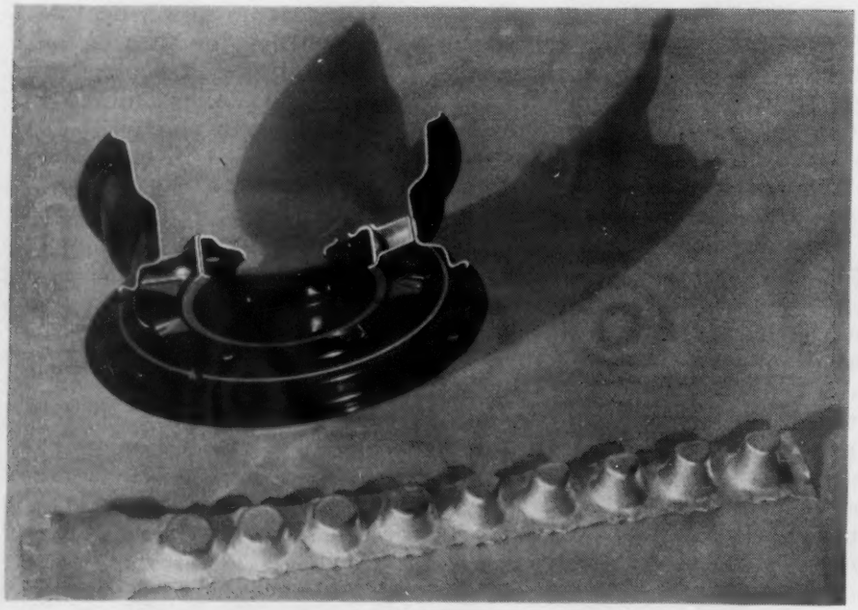
drawn out in successive stages, in a press equipped with a multiple progressive die. Depth of the final draw is 2 to 2½ inches, depending upon wheel size. Drawing technique has been perfected to such an extent that even at the point of maximum draw —the crown of the spoke—the stock has been reduced in thickness only to 0.070 inch, compared with the original 0.093 inch.

Following the drawing operation, the piece is placed on a table provided with a special revolving fixture which bends the strip to circular shape ready for welding. After being bent it is clamped in a large re-

FLASH welding hoops for the wheel rims is shown at the left. Below is the assembly department where plated spiders are pressed into rims, riveted and the mounting flange are welded into place. At the bottom of the page is shown a section of the finished wheel, illustrating clearly the component parts. Also shown is a partly finished spoke unit, indicating the progressive steps in drawing out the spokes before the unit is bent to circular shape and welded

tively. The strip is notched in a punch press, to provide a better shape for the subsequent drawing operations. This notching operation consists of cutting out segments along both edges of the strip, between the spots where the spokes are to be drawn. A wavy edge thereby is produced and the steel draws more easily into the spokes.

Next the notched strip is placed in a heavy press where a compound die performs the first draw, cupping out the steel to a depth of about ¾-inch for each spoke. The strip then is conveyed through a continuous furnace and heated at 1670 degrees Fahr. to relieve any strains set up by the initial draw. Following this treatment, the spokes are pickled to clean the surface, and then fully



sistance or flash welding machine and the abutting edges flashed together. Following this the weld bead or flash is removed in a special trimming machine. The side flange then is rolled down smooth and turned in on one side to accommodate the mounting flange. The spider, as it is called, is internally and externally sized on automatic machines and is then ready for cleaning and chrome plating.

A heavy coating of plate is applied to produce as near an impervious surface as is possible. The base plate is copper, over which nickel is electroplated and finally chromium. Plating is specified in grams per square foot—a total minimum of 18 grams. Lower limits for copper and nickel are 6 grams per square foot, each; chromium comprises a flash coating only. Following plating, the spider is ready for assembly into the wheel.

Rims likewise are formed and welded from strip steel, an approxi-

mate analysis being 0.15 per cent carbon, 0.37 manganese, 0.015 phosphorus and 0.030 sulphur. Rockwell B hardness ranges 55-65. The strip is fed into bending rolls which form it into hoop shape, following which it is flash welded and the weld bead cut off. To remove weld strains the joint is heated up in a resistance-type heater and the weld peened in a press. This also serves to smooth the joint and make it less noticeable in the finished rim.

After this operation the rim is given three separate rollings on machines which form the desired contour. The rim is clamped in these machines and rotated at high speed. Forming rolls gradually move into position and groove the steel to the proper shape as it is being revolved. Correct size is checked in internal and external sizing machines and the rim is then ready for painting and the subsequent wheel assembly.

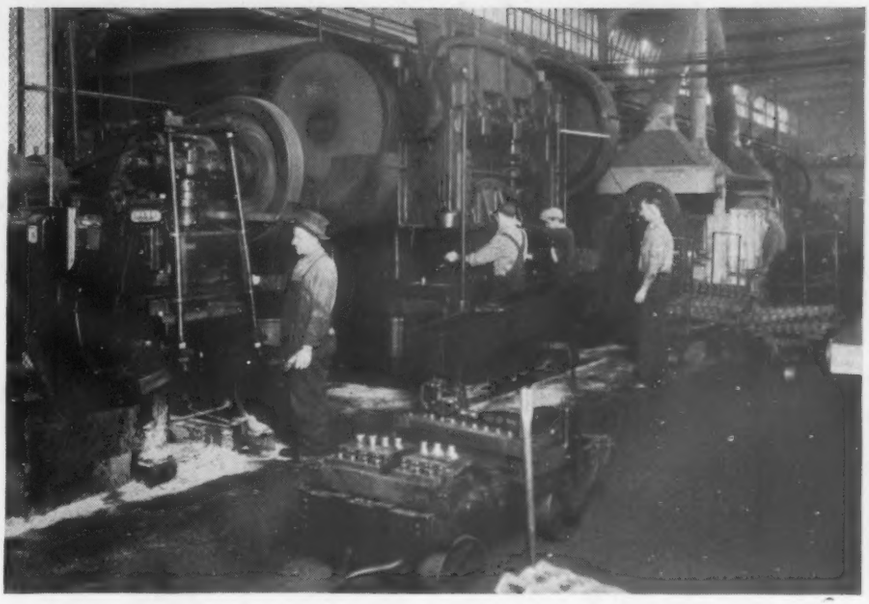
The chrome plated spider is forced into the rim on a special hydraulic press, sizing treatments on both spider and rim assuring a snug fit between the spoke ends and the rim. Following this assembly the wheel is spun rapidly and checked closely for throwout, maximum lateral throwout being confined to 0.035 inch. The assembly next is punched for rivets, each spoke being held firmly to the rim by a single rivet. A pressed steel mounting flange is spotted in the center of the spider and is arc welded automatically entirely around its circumference on one side and tack welded at four spots on the reverse side.

The bead formed in the arc welding operation then is faced off and the wheel again checked for both lateral and radial throwout. Any wheels which exceed the limits on throwout are taken out of the production line and re-straightened.

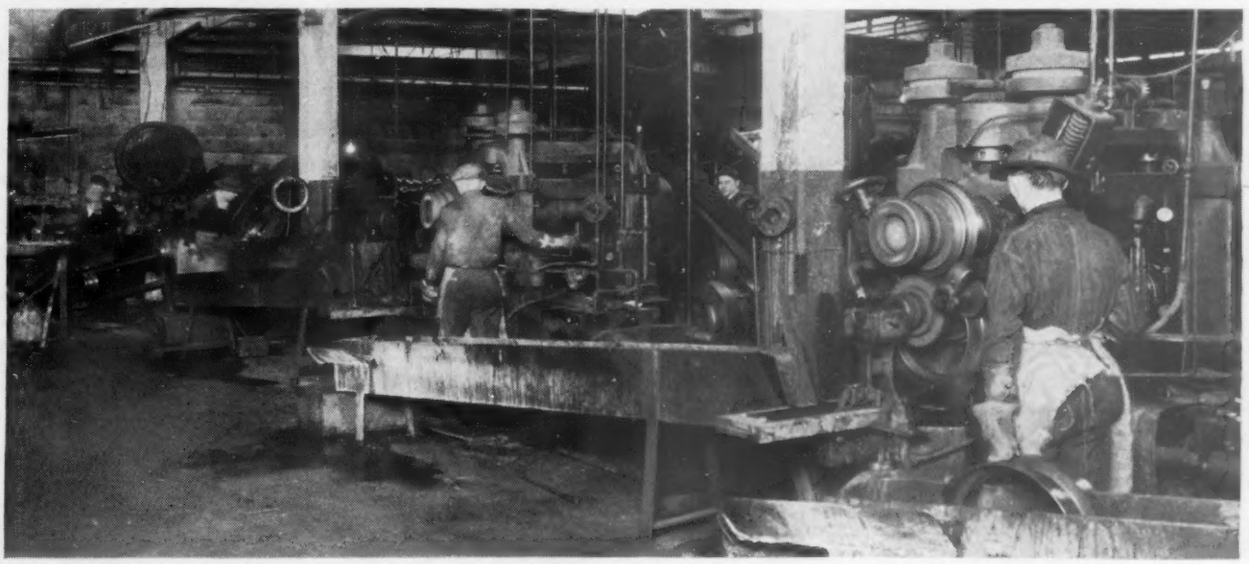
Checks are being made continually on the strength of this new type of wheel. In one test the wheel is mounted in a fixture which can be rotated and a load applied through lever and cable at right angles to a vertical shaft attached to the center mounting flange of the wheel. The wheel, clamped at the rim, is rotated at high speed and the arrangement is such that the wheel members are subjected to alternate compression and tension. The wheel usually is rotated until failure occurs and count is kept on the number of revolutions made before failure. Tests made on the drawn-spoke wheel and compared with similar tests made on other conventional type wheels have shown the remarkable strength of the former.

The Cleveland Welding Co. manufactures many other types of wheels and rims, both for passenger cars and trucks, nearly all being made on the same general principle of forming and flash welding. On some of the large truck wheels, exceptionally heavy equipment is required to shape and weld the steel. A separate division of the plant has been set up to handle all this heavier work.

Other welded products include washing machine top flanges in both steel and aluminum, locking rings for steel barrel tops, and the like. Recently a metallurgical control department has been established to supervise weld quality, to maintain a check on steel analysis and to investigate any problems which arise in the manufacturing operations.



Furnace in background anneals spider strips after notching and cupping operations. Adjoining press has multiple die for carrying out full draw. Dies for this press are shown on the truck in the foreground



TWO of three stands of rolls which draw out the contour of the wheel rims from the flat welded hoops. The inclined table partly visible in the left background is an external sizing machine

Metal Strength Increased By Graduated Stressing

METALS such as hot-rolled pig iron and brittle cast iron may be coaxed into greater strength by applying gradually increasing stresses to them while they are being rotated, experiments recently conducted by J. B. Kommers, professor of mechanics at the University of Wisconsin, Madison, Wis., have revealed.

The strength of hot-rolled iron may be increased as much as 24 per cent, while that of brittle cast iron may be increased by one-third, Prof. Kommers has shown. His experiments show also that even notched specimens of metal, which are usually considered much weaker because of the notch, may be coaxed into greater strengths by gradual application of slowly increasing stresses while rotating.

His experiments are deemed important because of the need for greater knowledge concerning the strength of various metals. A further purpose was to obtain information regarding fundamental properties of materials subjected to repeated stresses.

Coaxing metals into greater resistance against fatigue, that is, resistance to breaking down, has been recognized by engineers for several years, but has been shown to be much more important than was originally supposed, by Prof. Kommers. In earlier experiments metals were subjected to a constant stress slightly less than their original endurance limits. Understressed in this manner while in rotation through millions of cycles, the endurance limit of the metals gradually increased.

Shows 25 Per Cent Gain

In one experiment of this kind, Prof. Kommers subjected cast iron with an original endurance limit of 9300 pounds per square inch to a stress of 9000 pounds per square inch through 40,000,000 cycles. The new endurance limit of the cast iron gradually increased to 11,600 pounds per square inch, or an increase over the original endurance limit of 24.7 per cent.

In experiments conducted during the past few years, Prof. Kommers has subjected metals to a gradually increasing understressing instead of one that remained constant. Again using cast iron with an original endurance limit of 9300 pounds per square inch, he started testing the strength of the metal with an understress of 6500 pounds per square inch.

This understress was gradually increased to 9300 pounds per square inch—the original endurance limit—and as a result, the cast iron was coaxed into a new and greater endurance limit of 12,200 pounds per square inch, or an increase over the original limit of 31.2 per cent.

In the case of hot-rolled iron, when a constant understress was applied, the metal's endurance limit was increased only about 10 per cent, but when a gradually increasing understress was applied, the iron's endurance limit to stress was increased from 24 to 26 per cent.

In the case of machines, these experiments revealed that the subjection of a machine to preliminary runs at less than its rated capacity very likely will strengthen those parts which are being subjected to fatigue action, that is, a machine which has run satisfactorily for years without fatigue failures, if properly designed and not at all times overstressed, probably is stronger in those parts subjected to fatigue that it was originally.

Cast iron of low strength prepared so that the specimen had an imposed notch or flaw with square shoulders does not have a lower endurance limit to stress, although such a notch in steel would reduce the endurance limit in this metal 50 per cent, the experiments show. In addition, the notched specimens of cast iron were also greatly strengthened in their resistance to stresses by the gradual increases of understresses while the specimen was rotating. In the case of iron, however, it was shown that as the strength of the iron increases the material becomes more sensitive to the notches, with the result that the endurance limit is gradually reduced by a greater percentage.

This Chart has been prepared to assist you in the selection of the proper grade of steel for a particular purpose and the grades are arranged in descending order of suitability. It lists the most commonly used grades of steel according to their adaptability for specific purposes. The similarity of properties, the peculiarities of each grade of steel and the variations in response to particular treatment make it difficult to draw definite dividing lines.

Machinability	Cold Forming	Machinability and Cold Forming	Carburizing		Machining and Hardening	Heat Treating for Strength and Toughness
			Machinability	Carburizing		
Hi. Sul. Bess.	SAE 1010	X-1314	X-1314	SAE 2315	X-1335	SAE 2345
SAE 1112	SAE 1015	X-1315	X-1315	SAE 4615	X-1035	SAE 2330
X-1314	SAE 1020	SAE 1120	SAE 1120	SAE 6115	1040	SAE 6135
X-1315	Soft Bess. (Not	SAE 1112	SAE 1020	SAE 3115	1045	SAE 4140
SAE 1120	Screw Stock)	Hi. Sul. Bess.	SAE 1015	SAE 1015	1335	SAE 3140
			SAE 6115	SAE 1020		SAE 4130
			SAE 4615	X-1315		SAE 1335
			SAE 3115	X-1314		X-1335
			SAE 2315	SAE 1120		SAE 1045
						SAE 1060
						SAE 1035

MACHINABILITY—Considering SAE 1112 as a standard of 100% from the standpoint of Machinability, the other grades will be figured in relation to this standard as follows: (These percentage figures are of course only approximate).

Higher Sulphur Bessemer	120%	SAE 1335 Annealed	65%
SAE 1112	100%	SAE 1045 Annealed	60%
X-1315	85%	SAE 1040	60%
X-1314	85%	SAE 1035	60%
SAE 1120	80%	SAE 1020	60%
X-1335	75%	SAE 6115	60%
SAE 6135 Annealed	65%	SAE 4615	60%
SAE 4130 Annealed	65%	SAE 2345 Annealed	60%
SAE 2330 Annealed	65%	SAE 3115	55%
SAE 4140 Annealed	65%	SAE 1015	55%
SAE 3140 Annealed	65%	SAE 2315	55%

The following BRINELL HARDNESS numbers are approximate averages. They are based on one inch diameter bars—cold drawn. In most cases smaller sizes will be somewhat harder and larger sizes slightly softer than the figure given. For the hardness of turned bars, deduct about 15% from the figure given.

	Brinell		
High Sulphur Bessemer	183	SAE 3140 Annealed	201
SAE 1112	183	SAE 1335 Annealed	197
X-1315	167	SAE 1045 Annealed	192
X-1314	159	SAE 1040	187
SAE 1120	152	SAE 1035	174
X-1335	192	SAE 1020	152
SAE 6135 Annealed	192	SAE 6115	192
SAE 4130 Annealed	197	SAE 4615	192
SAE 2330 Annealed	197	SAE 2345 Annealed	201
SAE 2330 Not Annealed	241	SAE 3115	201
SAE 4140 Annealed	201	SAE 1015	143
		SAE 2315	192

A rapid way to figure relation between a Brinell Hardness number and tensile strength is to use a ratio of one to five hundred, i. E. 202 Brinell Times 500 Equals 101,000. We do not recommend the use of the Rockwell "C" scale at hardnesses less than 20 or the use of a Brinell at hardnesses over 600.

WALL CHART LISTS S. A. E. STEELS: Reproduced above is one section of a new 21 x 28-inch wall chart published by the Wyckoff Drawn Steel Co., Ambridge, Pa., to assist the engineer in selection of the most suitable steel for a certain purpose. Included on the chart are hardness conversion tables, relating Rockwell, scleroscope and brinell hardness number; tables giving weights of round, square and hexagon cold-drawn bars; and specifications for S.A.E. automotive steels

Chrome and Nickel Plated Metals Find Wide Use

Chromium and nickel have played prominent parts in the trend toward the improvement of the appearance value of numerous metal products as well as in the development of effective decoration schemes for buildings, stores, and the like. Chromium, because of its corrosion resisting properties, plays a double role in protecting as well as in beautifying exposed surfaces and while stainless steels are preferable, although more expensive, for applications involving the presence of severe and sustained heat and corrosive agencies, the protection afforded by nickel or chromium surfaces is adequate in many instances.

Various metal bases having plating of chromium or nickel may be obtained in flat sheets and strips or in long continuous coils for automatic fabrication. When used in these forms the necessity of coating the fin-

ished product after fabrication is eliminated. Among products made from these materials are kitchen table tops of chromium-surfaced steel and electric toasters made of similar metals.

These metals are one of the products of the American Nickeloid Co., Peru, Ill. The cold-rolled steel base is given a nickel coating as well as a copper strike before the application of the chromium finish. The material can be bent and formed and will withstand some drawing.

Nickel and chromium finishes also may be obtained with zinc, tin plate, brass, copper or nickel-silver bases, each of which is best suited to a particular application depending on the type of service and cost to be met. Various patterns may be obtained in applying the finish when the material is to be used in decoration schemes.

Simple Speed Shift and Flexible Feeds Make Upright Lathe a Versatile Unit

REDUCING the time interval between cuts, which always has been an important objective in the development of machine tools, has been accomplished in an unusual manner in the new hydro-shift vertical turret lathes of the Bullard Co., Bridgeport, Conn. These new units, which were announced briefly on page 48, Feb. 5 issue of STEEL, are characterized by flexibility, accessibility and ease of operation.

The name "hydro-shift" pertains to a hydraulically operated speed shift mechanism, which is actuated by means of filtered oil delivered under pressure from the main oil pump. Speed selection is by direct reading of a visible indicator dial, controlled by a crank lever easily reached from the operator's station. If the table is operating at 3.1 revolutions per minute and a higher speed is desired, the selection is made according to the dial reading without stopping operations. When ready to change speed, the clutch lever is moved to bring the table to a full stop, then thrown back into engaged position. In the interval, the gears have been shifted hydraulically to the selected speed shown on the dial. This system eliminates the necessity of figuring the proper combination of levers to obtain the desired speed, and thereby reduces the lost time between cuts.

Heads Provide Flexibility

Another factor contributing to flexibility is the number and range of the tool heads. As shown in the accompanying illustration, the cross rail carries two main heads—a ram type for boring on the left and a turret type on the right. Purchasers, however, may optionally specify two ram-type heads. Each main head has its own individual feed works, and can be rapid traversed vertically or horizontally.

Two side heads also are provided, mounted directly upon the ways of the bed. Each has its own feed works, permitting individual vertical or horizontal feed of the side head and slide, respectively, as well as vertical power traverse of the side head and horizontal power traverse of the slide. Thus the head may be power traversed up or down while the slide is power traversed in or out.

Direct reading dial controls are provided on the end of each feed works so that the feed of any head can be changed at any time without stopping the table or feed works of any other head. Direct reading micrometer dials with observation stops enable the operator to hold limits and duplicate sizes conveniently after the first setting is completed.

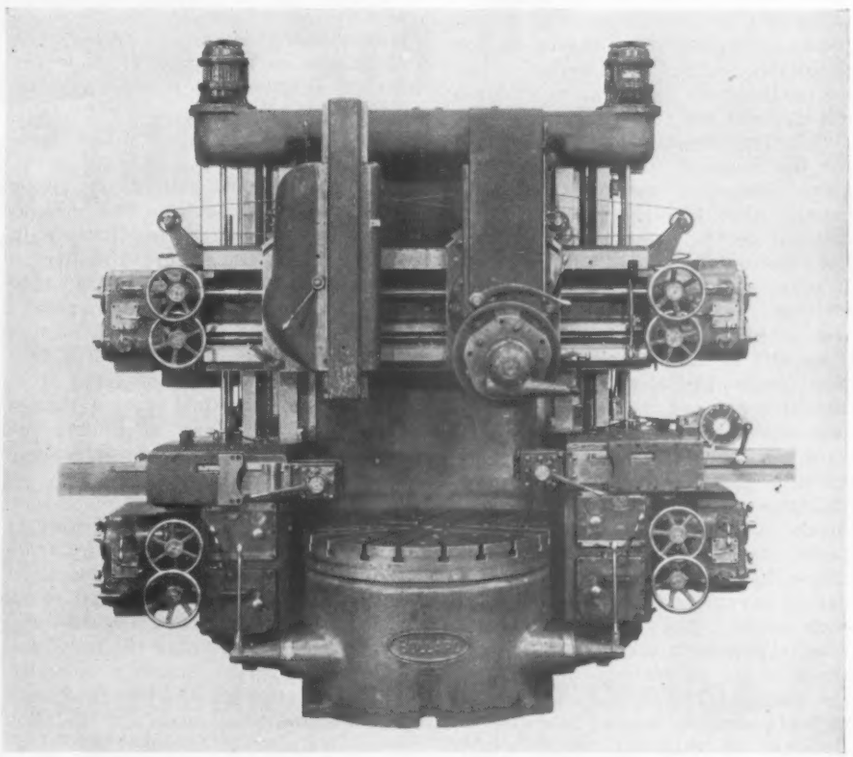
Necessity for rigidity and ruggedness in these machines dictated a careful selection of materials. The bed is cast with heavy internal ribs. Base walls are thick to eliminate vibration and to provide a rigid support for the cross rail and side heads. Wide bearing surfaces and heavy gibs are used to insure rigidity of slides. The cross-rail, main head saddles, swivels and side heads are single unit gray iron castings. The main slides are steel castings and the turrets are forged steel. The side head slides are forged steel bar rams with four-face, indexing turrets. Antifriction bearings are employed throughout, with exception of the table bearing.

Pressure Lubrication

For lubrication, an oil pump in the bed connected directly to the headstock forces the lubricant from a sump, passes it through a filter system and distributes it under pressure regulated to suit individual requirements. This takes care of the ways of the rail, saddles, slides, feeds screws, racks, pinions and downfeed rods. Forced lubrication is delivered to all bearings in the headstock and side heads. Feed works have their own reservoirs.

Main drive, rapid traverse and rail raising are by push button controlled individual motors. Limit switches and other protective devices afford a high degree of safety in operation.

The 56-inch machine is provided with a separate water pan and pump for cutting coolant. In the 66, 76 and 86-inch units, the water pan is built into the concrete floor in order to give the stable foundation necessary.



The new Bullard hydro-shift vertical turret lathe is offered in four sizes—56, 66, 76 and 86 inches. The machine shown here is the 56-inch model

Intergranular Corrosion of 18-8 Halted by Columbium

RESEARCH aimed at improving the properties of stainless steel, especially in the high-temperature range, was summarized in two papers presented at the annual meeting of the American Institute of Mining and Metallurgical Engineers in New York, recently.

Use of columbium as a means of preventing intergranular corrosion in chrome-nickel steels was discussed by Russell Franks, research metallurgist, Union Carbide & Carbon Research Laboratories, Long Island City, N. Y., a study in which Dr. F. M. Becket, president of this research organization collaborated.

As a result of many heat treatments and tests on these steels, Mr. Franks said it was indicated that addition of columbium in moderate and economical proportions prevents intergranular deterioration of austenitic chrome-nickel steels when exposed concurrently to elevated temperatures and chemical corrosion. This enhancement of corrosion resistance does not require sacrifice of present valuable properties of these steels.

Will Stimulate Use

Susceptibility to intergranular corrosion has limited use of this steel in some logical fields, and the apparent remedying of this defect may be expected to give fresh impetus to the industrial use of the material. Present sources of supply of columbium appear to be sufficient for the demand.

Differing theories have been offered for the cause of intergranular corrosion. Remedial measures proposed usually have involved the use of additional agents, notably titanium. In the discussion which followed Mr. Franks' presentation, the value of titanium as such a remedial agent was given defense.

Results in the extensive investigation made by Messrs. Frank and Becket convinced them that, all matters considered, columbium offers the most satisfactory solution of the intergranular corrosion problem. Evidence indicates two distinct problems arise in the use of the austenitic chrome-nickel steels at elevated temperatures, although near 650 degrees Cent. both defects concur and may even intensify each other. The loss in toughness from exposure to the higher temperatures is not so serious, inasmuch as the steels still exhibit Izod values of 40 foot-pounds or more. Likewise the decrease in corrosion resistance is general rather than localized at the grain boundaries. Hence the extreme desirability of an agent able to inhibit changes that occur in the lower temperature range and which initiate attack at the grain boundaries of the metal, even though the steels at the same time may lose toughness when exposed to the higher range.

It was observed that the presence of approximately four times as much columbium as carbon in test pieces diminished the range of temperatures through which these steels were attacked at grain boundaries. When the content of columbium was increased to about seven to one, a marked improvement was obtained, although it was still possible to disintegrate the steel. Further increase of columbium to at least 10 times carbon gives steels that fail to disintegrate after exposure to long or short periods at all temperatures between 300 and 850 degrees Cent. Except in connection with very low carbon content, columbium does not correct greatly the loss of toughness characteristic of exposure in the approximate range of 650-900 degrees Cent.

Chrome-nickel steel containing columbium in the proper ratio to carbon is well adapted to welding by either the arc or oxyacetylene process. In the welded state protection from localized failure in the weld or adjacent zone is attained when columbium is substantially four or five times the carbon content, providing the latter does not exceed 0.10 per cent.

TOTAL oxygen content of highly alloyed steels such as 18-8 chrome-nickel bears a direct relationship to the elevated temperature ductility as determined by the seamless tube piercing process, according to results cited in a paper by Newell Hamilton, research metallurgist, Babcock & Wilcox Tube Co., Beaver Falls, Pa. Theoretical consideration of this change in ductility involves, of course, the manner in which the oxygen is combined in the steel.

To determine the effect of oxygen on the tube piercing of 18-8 alloy, a number of heats were selected from the mill production of this alloy. In each case the heats selected were either good or bad and nothing was left in doubt concerning the mill variables that might possibly have affected the piercing. As some six years of tube-production records of the alloy were available it was possible to select only heats of which the histories were known definitely. In all cases the bad material had been run along with some good material in order to make the comparison more exact.

The defect that occurred in the selected heats was called "outside checking," distinguished by outside transverse cracks originating in the piercing mill. After plug rolling these cracks opened and varied in depth from a few thousandths of an inch to ruptures entirely through the wall of a heavy-walled tube. The defect had been analyzed as lack of high-temperature ductility in the metal and in all cases had been directly traceable to a particular heat of steel.

The samples selected for vacuum fusion analysis were cut from either billets or tubes, so that the same ratio of core and rim was maintained in all cases. Nitrogen determinations were made on these heats by the distillation method. The usual chemistry of these heats was well within the commercial range for this alloy and absolutely no correlation existed between the outside checking and the carbon, manganese, sulphur, phosphorus, silicon, chromium, nickel or iron contents of the heats.

Poor Material High in Oxygen

In tests, oxygen contents of the heats exhibiting the checking were from two to three times the values obtained on good material. Likewise, the maximum and minimum oxygen values for these two classifications did not overlap and the degree of checking was roughly proportional to the oxygen content of any one heat. The correlation of hydrogen and nitrogen contents and outside surface checking was not nearly so conclusive. The variation in hydrogen between good and bad materials might be regarded as within the error of the method. Several of the heats were below the average for good heats in both hydrogen and nitrogen content.

Recently a number of heats of an alloy steel containing 5 per cent chromium, 0.50 per cent molybdenum and 0.16 per cent carbon maximum developed a bad surface condition, which apparently had originated in the piercing mill. The final form of the defect was more in a longitudinal direction than in a transverse direction but it had a close resemblance to the external checking that had occurred on the 18-8. A number of these heats, as well as some that had processed satisfactorily, were analyzed by the vacuum fusion method, which showed practically the same difference existed between the oxygen values of the good heats and those exhibiting the outside checking, as in the 18-8 results. The values also were of the same magnitude.

All of the alloy steels represented in this investigation were made by the basic electric process in 6-ton to 12-ton heats. The 18-8 heats were processed into tube rounds and then

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rough-turned to eliminate surface defects, while the 5 per cent chromium, 0.50 per cent molybdenum heats were rolled into tube rounds after chipping in the bloom and in some cases chipping in the round but with no rough turning. Both alloys represented an excellent quality of steel, and the tube billets were inspected carefully before rolling into tubes.

Alloys investigated contained appreciable amounts of chromium and, owing to the great activity of this element, it is probable that the oxygen present was in combination with the chromium. The amount of inclusions present in these steels at room temperature was not excessive and could not possibly have affected the workability of the steel if they remained unchanged when heated to the temperatures required for piercing.

This suggested the formation of an oxygen-bearing constituent at elevated temperatures, having physical properties differing from the alloy matrix at these temperatures and of sufficient volume to cause the pronounced effect upon the elevated-temperature ductility of the alloy that has been noted. Efforts to prove the existence of such a constituent by microscopic examinations at room temperature have as yet been unsuccessful.

Oxygen Held Responsible

That some combination of oxygen and chromium is responsible for the abnormal behavior of these steels at elevated temperatures was indicated by the fact that heats of 18-8 alloy subjected to ladle deoxidization with aluminum or zirconium were pierced successfully even though their total oxygen content was above the maximum for good piercing quality. This might be explained by the supposition that the oxygen in these heats has been "fixed" to a more stable form by combination with aluminum or zirconium so that it does not affect the elevated temperature ductility.

Such "fixing" of the oxygen content of a heat of 18-8 is not a satisfactory solution to this problem, for it has been found that resulting inclusions seriously interfere with the working of the alloy in other ways. The fact remains that oxygen in 18-8 and other high-chromium alloys, regardless of its combination, is detrimental to the manufacture of tubes and all efforts should be made to keep it at a minimum. It is realized that this minimum is low (less than 0.01 per cent oxygen) but experience has shown that many thousands of tons of these materials have been made that have contained less than this minimum of oxygen.

I. N. ZAVARINE, assistant professor of physical metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., described apparatus suitable for the study of magnetic transformation in steels under conditions of equilibrium as well as during quenching. He presented a summary of equilibrium runs with carbon steels, in which it was shown that close association between the magnetic and the phase transformation existed only for steels containing 0.60 per cent or more carbon. Magnetic transformation, it was revealed, is not related to the phase transformation of steels containing less than 0.60 per cent carbon.

Describing quenching experiments with carbon steels, the speaker asserted that, with rates of quenching far in excess of those necessary for the formation of martensite, the magnetic transformation was not confined to a single temperature or to a narrow range of temperatures but was spread over a wide range and over a considerable interval of time. Mr. Zavarine indicated there was no relationship between the phase and magnetic transformations during quenching.

Diffusion in Silicon Iron

N. A. Ziegler, Westinghouse Research Laboratories, East Pittsburgh, Pa., declared his research indicated no appreciable diffusion, resulting in a change of chemical composition, takes place in silicon iron during two treatments. He also observed that when unalloyed iron is subjected to an oxidizing heat treatment, iron oxide scale is formed on the surface, but that there is nothing to prevent oxygen atoms from diffusing into the metal and saturating it if heated to a sufficiently high temperature. On the other hand, in silicon alloys, with at least 2 per cent silicon, a film of iron-silicon will be found on the surface, acting as a barrier to the diffusion of oxygen atoms into the alloy.

Equipment and procedure for observing the formation of martensite in certain alloy steels at low temperatures was discussed by O. A. Knight, associate professor of metallurgy, and Helmut Muller-Stock, graduate student, both of Pennsylvania State college, State College, Pa.

Discussing the effect of coal composition on properties of metallurgical coke, Roy P. Hudson expressed the belief that divergent opinions are held on the subject by some of the most capable men in the iron and steel industry. Not many years ago it was generally believed that extraneous matter in the coal mixture, especially in the small-sized coal, was more or less essential in the production of blast furnace coke.

In contradistinction to this theory, the speaker said some metallurgists now hold that the extraneous matter in the coal mixture has a greater negative value than an equal amount of inherent ash. He declared that neither of these theories ever has been proved in practice, and held that statements to the effect that extraneous matter in coking-coals has a greater negative value than an equivalent percentage of inherent ash should be considered with the fact in mind that such statements were founded largely on mere visual observation in isolated instances and in consideration of only one or two particular varieties of coals.

Book « « Review « «

Iron and Steel Tariff "Bible" Lists 480,000 Freight Rates

Freight Tariffs of All-Rail Rates on Iron and Steel Products; loose leaf binder, 540 pages, 8½ x 11 inches; published by American Iron and Steel institute, New York; supplied by STEEL, Cleveland, for $20.00, plus 30 cents postage.

One of the most comprehensive freight tariff books ever issued, this compilation of freight rate data has just been completed by the American Iron and Steel institute after exhaustive research and now is being distributed throughout the industry.

The book contains fully 480,000 freight rates from 30 basing points, and covers practically all finished steel products. It was compiled by the Rate Clerks committee, a subcommittee of the institute's Tariff committee. The book is regarded by traffic men in the industry as comprising the tariff "Bible."

Because of the comprehensive character of the book, experts estimate that it cuts down by 40 per cent the time normally required by the average company in checking rates.

According to institute officials, the tariff book provides those who use it with the combined service of the best traffic departments in the iron and steel industry. Each traffic department in every large steel company is assigned a territory to police and when any rate change occurs this is instantly reported to the institute and the information is transmitted to loose-leaf pages and sent to subscribers of the book so that it is always up to date.

The book is proving of particular value not only to steel manufacturers but also to jobbers who have salesmen on the road. Equipping the salesmen with the book not only saves the salesman's time but provides him with dependable, authoritative tariff information.

The cost of new sheets is 10 cents per sheet.

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(MAXIMUM 6% CARBON)
LOW-CARBON FERROCHROME
(IN GRADES, MAXIMUM 0.06%
TO MAXIMUM 2.00% CARBON)
CHROMIUM METAL
CHROMIUM-COPPER
MISCELLANEOUS CHROMIUM ALLOYS

SILICON
FERROSILICON 15%
FERROSILICON 50%
FERROSILICON 75%
FERROSILICON 80 TO 85%
FERROSILICON 90 TO 95%
REFINED SILICON
(MINIMUM 97% SILICON)
CALCIUM-SILICON
CALCIUM-ALUMINUM-SILICON
CALCIUM-MANGANESE-SILICON
SILICON COPPER
MISCELLANEOUS SILICON ALLOYS

MANGANESE
STANDARD FERROMANGANESE 78 TO 82%
LOW-CARBON FERROMANGANESE
MEDIUM-CARBON FERROMANGANESE
MANGANESE METAL
MANGANESE COPPER
MISCELLANEOUS MANGANESE ALLOYS

SILICO-MANGANESE
ALL GRADES INCLUDING SILICO-SPIEGEL

TUNGSTEN

VANADIUM
ALL GRADES

ZIRCONIUM
ALUMINUM-ZIRCONIUM
SILICON-ZIRCONIUM
ZIRCONIUM-FERROSILICON
ZIRCONIUM-MANGANESE-
SILICON

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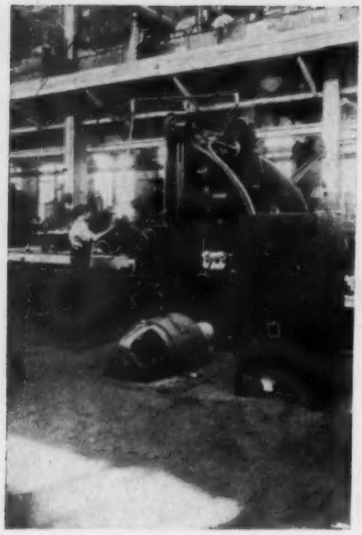


Making the Most *of* METHODS AND MATERIALS

METAL surfaces usually are prepared for sprayed metal by thorough sandblast cleaning with 16 to 20-mesh angular silica sand, or with steel grit. It is necessary not only to clean the surface but to roughen it thoroughly. Sand or grit blasting may be eliminated on such work as can be handled in a lathe, by taking a roughing cut of between 20 to 40 threads to the inch, and so setting the tool that a roughened and slightly torn surface is obtained. When building up worn shafts and scored bearings, it is advisable to undercut them at least 0.040 inch on the diameter to avoid feather edges and to give a reasonable thickness of sprayed metal.

$ $ $

Application of wear-resisting material to grain scraper knives in a milling plant has increased the life ratio of the knives 5 to 1. These knives are 24 inches long and 8 inches wide and are used to scrape the ground grain from steel rollers in the mill. The continuous contact of the scraper blade on the steel rollers causes an ordinary steel blade to wear down rapidly. About 3½ pounds of hard-facing material is applied in a groove 2 inches wide and 3/16-inch deep at a cost of $25.60 per knife, including labor and material. After the facing is completed, the blade is ground down to make a perfect scraping edge.

$ $ $

IN PREPARING to meet increased demand for its services and product, a builder of heating furnaces has reorganized its engineering department, placing so-called sales engineers in charge. It is expected that the outside viewpoint of these sales engineers will result in the design of installations which will best fit the requirements of each particular purchaser. This is in contrast to the former practice of designing a furnace for a particular purpose and then letting the customer adapt it to his individual requirements.

$ $ $

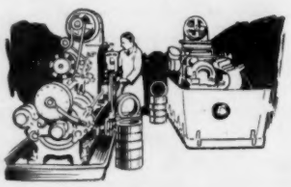
A large steel manufacturer recently furnished 480,000 pounds of 3.5 per cent nickel steel billets to the Charlestown navy yard, Boston, for making forged anchor chains.

$ $ $

A new metallic zinc paint is claimed to resist rust and corrosion due to atmospheric exposure for a period twice as long as for red lead paint.

$ $ $

Frictional heat of turning or boring depends upon the nature of the metal, depth of cut, cutting speed, coarseness or fineness of feed. Heavier roughing cuts, higher cutting speeds, coarser feeds, can be realized by proper lubrication and adequate cooling of the tool. Likewise, effective



lubrication and cooling during light finishing cuts give a smoother finish. Higher finishing speeds are possible without heating the work, thus rendering calipering more accurate. Over a period of time, the use of correct cutting oil reduces tool expense, minimizes the number of rejects and increases production materially.

$ $ $

Tensile strength of sprayed metal varies from 2000 pounds per square inch for lead to 5000 pounds for steel, while the compressive strength nearly approaches that of solid metal. Although the tensile and torsional strengths of sprayed metals are comparatively low, such coatings always are applied to finished articles and never to parts which require strengthening, therefore, these properties are of secondary importance. The wearing properties of sprayed metals are said to have been found by actual test to be equally as good as those of solid metal, and in some instances better, as the spraying process tends to toughen the metal.

$ $ $

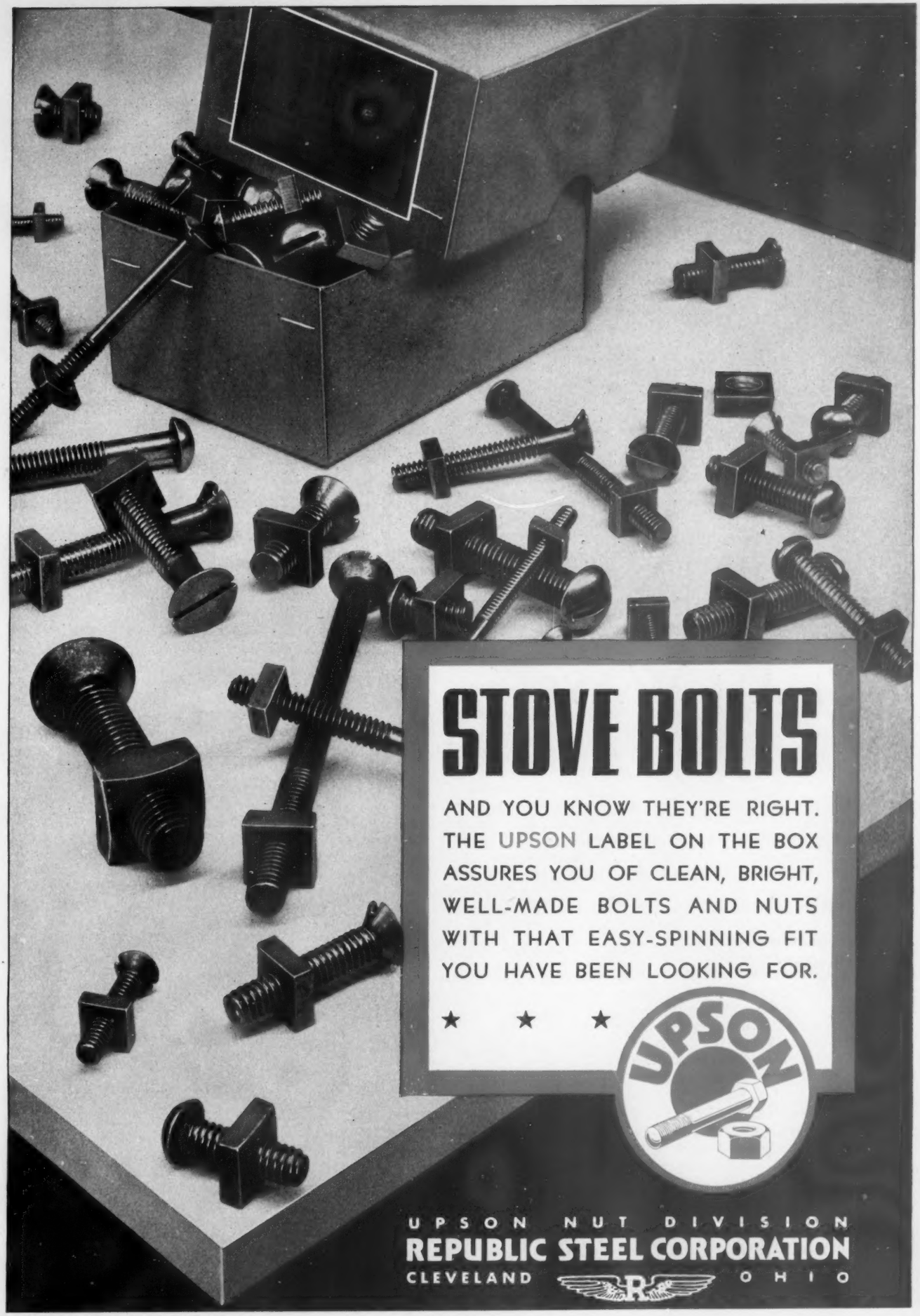
INCREASING use is being made of 18-8 chrome-nickel steel rivets as a means for combating corrosion in marine hull structures. Many small vessels, such as tankers, are utilizing rivets of this material, and the United States navy has made use of them in repairing submarine hulls. Stainless rivets are said to show excellent results in such service when carefully heat treated to produce a fine grain structure giving toughness and high impact resistance.

$ $ $

A manufacturer of rustproofing produces a special lubricant which is said to be unusually effective in metal forming and drawing operations. This material, refined down from pure wool fat, clings tenaciously to the metal and gives maximum lubrication to the dies. It does not disintegrate quickly but is easily removed in cleaning operations; has no perceptible or disagreeable odor; has no pronounced change in consistency through temperature variation, and is noncorrosive. Compounded with the proper amount of sulphur, talc or lithopone, it makes a good lubricant for stainless steel.

$ $ $

A nationally known manufacturer of pumps is using the metal spraying process in actual production for applying monel metal inlays to cold rolled steel pump shafts. These shafts are 1¼ inches diameter and 14 inches long, threaded on both ends. A section 12 inches long is prepared by rough machining; the gun is mounted in the tool post and 0.030 inch of monel metal is applied in 12 minutes, after which the shafts are passed through a centerless grinder and finished to specified dimensions.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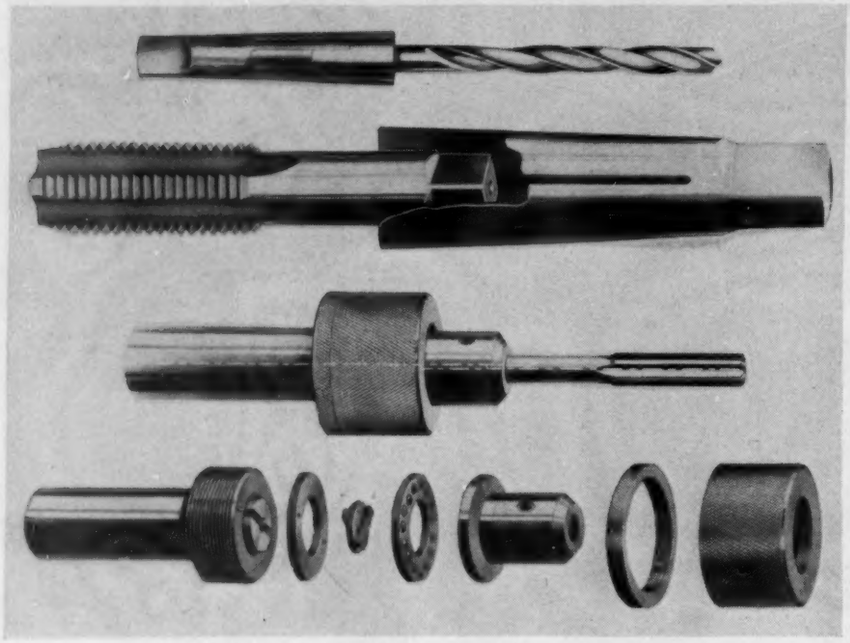


—Courtesy Scully-Jones & Co., Chicago

About 500 tons of steel is consumed annually in the manufacture of various types of tool holders. Above are shown, from top to bottom, tap chuck, drill chuck, floating reamer holder and disassembled view of the latter

LARGE USES OF STEEL IN SMALL WAYS

256th Article ◆ Tool Holders

WHILE a large amount of steel is required for the manufacture of various cutting tools such as drills, reamers, taps and the like, holders for such tools also account for the consumption of a substantial tonnage. Although holders are longer lived than the tools, production of the former nevertheless has involved the use of more than 500 tons of steel annually, principally in the form of bars. Increasing use of multiple spindle machines, especially in the automotive industry, has expanded the market for tool holders, with the trend toward high-speed metalworking a factor in the development of stronger and more efficient units.

As the largest single outlet for tool holders, the automotive industry directly and indirectly has been responsible for a number of improvements in the design of this product as well as of the tools which the various holders operate. Tolerances have been reduced, stronger steels are employed and economy of operation improved.

The principal types of tool holders, some of which are illustrated above, are adaptable to drilling, tapping and slotting of metals. These include tap chucks, drill chucks and chucks for holding keyway and T-slot cutters. The illustration includes typical examples of a drill chuck and a tapping chuck, the latter being cut away to illustrate the interior design and method of introduction of the tap.

Floating Type Used Widely

Another tool holder widely used is the floating reamer and tap holder, also shown above. These holders, which may be used in connection with chucks, are designed to permit tools to follow holes on a true line, regardless of irregularities in alignment of machine spindles and work. Friction is practically eliminated with the use of ball thrusts between hardened and ground surfaces. A knurled cap retains the assembled parts as a unit and serves as an adjusting nut to regulate the clearance which controls the floating action of the holder.

Self-aligning reamer holders, somewhat similar in design to the floating tool holders, are employed when angular irregularities exist in the alignment of machine spindle and the work. A spring is incorporated in certain forms of floating tap holders to permit the tap to start threading under this additional pressure.

Other tool holders include plain drill sleeves, extension sockets, quick change chucks, arbors for milling machines and for use with reverse spot facers, in addition to various types of collets.

Tool holders are made exclusively of steel and almost entirely from bars. During recent years the tendency has been toward the use of more alloy steel and less bessemer screw stock which formerly was used rather extensively. Fabrication of the various types of chucks comprises principally machining and grinding operations. Sleeves, however, may include a forging operation before the final machining. Chuck shanks are ground accurately to fit the machine spindle, tool or attachment with standard taper sockets. Holders generally are hardened by heat treatment after fabrication.

Economies Made Possible By Hardfacing Surveyed

Uses for hardfacing in leading industries and the economies effected by application of hardfacing are reviewed in a 96-page profusely illustrated booklet recently published by the Haynes Stellite Co., Kokomo, Ind., unit of the Union Carbide & Carbon Corp., New York.

The innumerable applications of this method are little realized generally and this booklet should serve to acquaint many with progress achieved recently in protecting parts against excessive wear by abrasion. In the steel industry, for example, hardfacing has been applied advantageously to rotary mud guns used to close blast furnace tap holes, skulling hooks, charging rams, gag press hammers, shear blades, spindles, guides, diagonal rolls, punches, sleeve gears, shear clutches and many other parts, increasing life in the ratio of as high as 16 to 1.

Similarly in industries relating to agriculture, automobiles, brick, cement, coke and gas, excavating, lumber and paper, machinery, mining, oil, power, beet sugar, aluminum and glass, notable economies have been effected, according to this brochure. A total of 494 typical applications are cited.

A concluding section of the booklet deals with procedure in applying hardfacing to a wide range of ferrous and nonferrous materials. Any of the standard fusion welding methods may be used, although several factors govern the choice of the methods of any particular application. The various hardfacing materials produced by the Haynes company are described and a complete index to the booklet is appended.

PROGRESS IN STEELMAKING

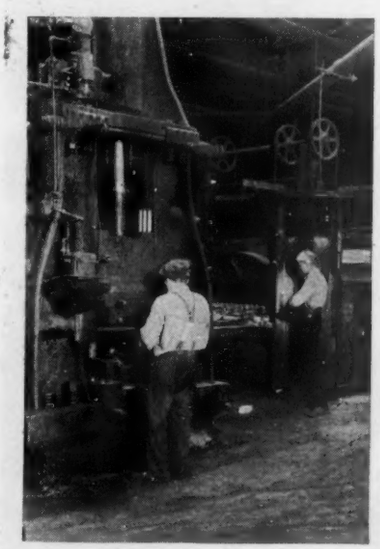
NEWLY developed refractories are permitting the construction of thinner walls in forging furnaces, thus facilitating more rapid heating and curtailing radiation losses.

♦ ♦ ♦

Testing furnace atmosphere by measuring the combustible components of gaseous mixtures now is accomplished automatically and continuously by an electrically-operated instrument. The unit operates on the principle of catalytic combustion and is equipped with an indicator calibrated to read directly in per cent of combustible gases. The standard range is from 0 to 20 per cent combustible gases and for any range the accuracy is within 10 per cent of the scale reading. The analysis appears on the scale in about 15 to 20 seconds. The instrument automatically operates on either 110 or 220-volt current and the observer has only to read the scale of the indicator to secure the analysis of the gas.

♦ ♦ ♦

New rust-arresting and preventing principles are claimed to be embodied in a new liquid rustproofing compound which can be applied by brush or spray over new or already rusted metal surfaces. The action of the liquid when applied to a rusted surface is said to weld the inert surface fast to the base metal and stop further progress of rust action by forming a nonporous moisture-proof coating. The original treatment can be made into a finish-coat by a single application, while aluminum powder, powdered graphite or dry red lead may be mixed with the liquid and applied to rusted surfaces for dual effect. The material when applied to new metal surfaces is claimed to prevent rust and, being transparent, does not cover up markings for identification signs.



Substitution of ferroaluminum for stick aluminum when making open-hearth additions affords 50 per cent higher efficiency because of the greater weight and higher melting point, according to an alloy authority.

♦ ♦ ♦

Rapid embrittlement in medium and high-carbon steel wires occurs immediately following their immersion in the pickling solution, according to tests conducted abroad. The rate of deterioration increases with the acid concentration and the temperature. Hard drawn wire, especially in the heavier gages, is extremely susceptible to the embrittling effects.

♦ ♦ ♦

Observing furnace conditions has been made comparatively simple by the development of a new port. A divided cover is provided which opens at a touch on the handle and closes automatically the moment the the handle is released by the operator. The design is such that it is impossible for the operator to leave the port uncovered and thus allow an inrush of excess air.

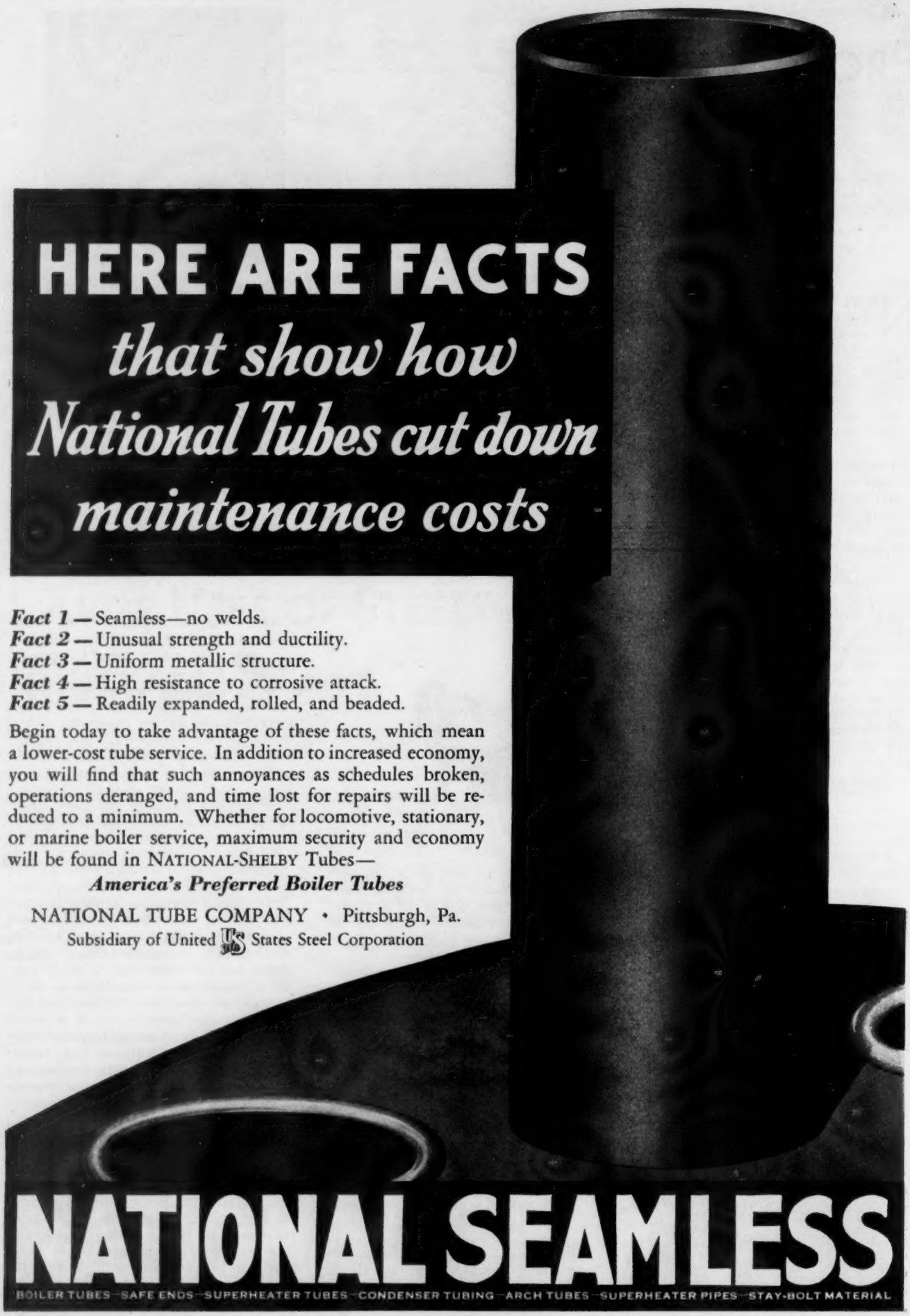
♦ ♦ ♦

Measuring the temperature of rods in transit through the various roughing stands, of billets being conveyed from the heating furnaces to the hot mill, or of skelp coming from the bending or welding furnaces has been made possible by the development of an industrial pyrometer. The unit, which records the temperature with little time lag, is nonsensitive to vibration and, hence, may be installed near the roll stands of the mill without jeopardizing its accuracy.

♦ ♦ ♦

Automatic screwdown limit switch and control have been developed to operate in conjunction with feeder and catcher tables serving 3-high sheet mills. The unit is designed for a maximum of seven passes. Any rolling schedule can be set up by adjusting the handles which project through the sides of the limit switch, each handle controlling one pass. The dial is calibrated in thousands of an inch of travel of the screw and each handle can be moved over the full range. The pass adjustments can be varied, and once the desired reduction of each pass is obtained, all adjustments can be altered to vary the specified gage being rolled. The limit switch is driven from the mill screwdown by a synchronous tie and gear unit to avoid the necessity of a mechanical connection between the mill and limit switch.

HERE ARE FACTS
that show how National Tubes cut down maintenance costs



Fact 1 — Seamless—no welds.
Fact 2 — Unusual strength and ductility.
Fact 3 — Uniform metallic structure.
Fact 4 — High resistance to corrosive attack.
Fact 5 — Readily expanded, rolled, and beaded.

Begin today to take advantage of these facts, which mean a lower-cost tube service. In addition to increased economy, you will find that such annoyances as schedules broken, operations deranged, and time lost for repairs will be reduced to a minimum. Whether for locomotive, stationary, or marine boiler service, maximum security and economy will be found in NATIONAL-SHELBY Tubes—

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BOILER TUBES—SAFE ENDS—SUPERHEATER TUBES—CONDENSER TUBING—ARCH TUBES—SUPERHEATER PIPES—STAY-BOLT MATERIAL

The Plastic Forming Of Metals

By PROFESSOR DR.-ING ERICH SIEBEL
Translated by JOHN H. HITCHCOCK

Part II—Forces and Flow of Material in Technical Forming Processes

8. Force Relations in Deep Drawing*

DEEP drawing is understood to be the forming of sheets and strips into hollow bodies, in which process the plane section comprising the initial shape is drawn into a matrix die by a forming die or punch. While the blank is being drawn in, the border of the blank projecting over the edge of the matrix die is hindered from the otherwise inevitable formation of wrinkles by a clamp (blank holder), provided with sufficient pressure, which holds down the border of the sheet. The annulus between punch and matrix die moreover, is so narrowly confined that waves and irregularities of material occurring in the disk edge are ironed out during their passage through this crevice.

Hollow Bodies Produced

In a single operation, hollow bodies of only little depth can be produced, because the drawing force otherwise increases so rapidly that it leads to rupture of the sheet. Deeper vessels, therefore are formed in many operations; in which a cup-shaped hollow body, produced in one stroke as previously described, is drawn by one or more additional strokes into matrix dies which become successively narrower, and the body thus becomes deepened by reduction of its diameter. In subsequent strokes formation of wrinkles is prevented by the blank holder.

Because of the extended application of the deep-drawing process in the technique of working sheets, the forces produced in this process will be investigated. The first draw of circular hollow bodies, is carried out in the following discussion. In subsequent draws, relations probably exist which are similar to those of the tube-drawing process discussed in detail (Part II, section 5).

The variation of force and the work of forming during deep drawing have been subjected to investigation many times, for the purpose of determining the effect of material resistance on one hand, and of the external forming conditions on the other hand. Although only vague conceptions regarding the stress relations in deep drawing were previously at hand, the knowledge was presented by K. Musiol[75] in 1900 that radial tensile stresses and tangential conjugate compressive stresses occur during the drawing of sheets. With regard to the magnitude of the drawing force, particularly as affected by the diameters of the blank and of the die, however, no correct judgment could yet be formed; although

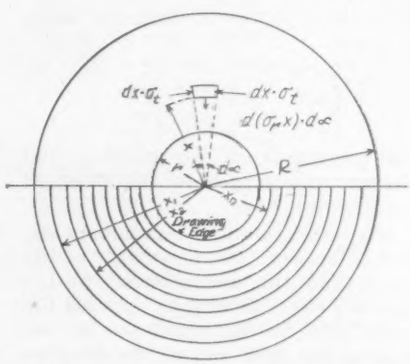

Fig. 107—Equilibrium of forces in deep drawing

the effects of the drawing speed, the pressure exerted by the blank holder, and the frictional resistance, already had been investigated. J. Blume[76] found later that the permissible deformation primarily is dependent upon the displacement of volume which occurs, an opinion which later was carried further by W. Sellin[77].

Th treatises of M. Sommer[78] and E. Ruhrmann[79] are concerned in detail with the variation of force in deep drawing. The former, in particular, merits consideration, because the author strives to evaluate individually all the factors which determine the drawing force. The determination of the compressive force acting in the peripheral direction, however, cannot be wholly satisfactory; because the effect of the radial stresses upon the magnitude of the tangential stresses is neglected. In contrast to this, C. L. Eksergian[80] found an expression for the stress calculation which permits consideration of the transverse stresses also. Because of the lack of a mathematically formulated condition of plasticity, however, this investigator still is prevented from determining the distribution of stress in the blank and the force requirement for drawing, from his derived expression.

Shear Stress Considered

In the following discussion, carrying further a hint previously given by E. Siebel[81], an attempt is made to obtain a representation of the requirements of force and energy during deep drawing, by use of the shear stress theory as the condition of plasticity. In the forming of a circular-shaped blank into a hollow body, if the blank thickness, s, is assumed to be constant* and all frictional effects are neglected, the radial stresses and the tangential stresses in each element of area, as shown in Fig. 107, are given by the equilibrium relations:

$$d(\sigma_r x) \times d\alpha = \sigma_t \times dx \times d\alpha$$

$$x \times d\sigma_r + \sigma_r \times dx = \sigma_t \times dx$$

$$d\sigma_r = -(\sigma_r - \sigma_t)\,\frac{dx}{x}$$

With the condition of plasticity $\sigma_r - \sigma_t = k_f$ (1), and by integrating within the limits from R to x, the result obtained is:

$$\int_R^x d\sigma_r = \int_R^x -k_f \times \frac{dx}{x} = \int_x^R k_f \times \frac{dx}{x} \quad \ldots\ldots\ldots (54),$$

in which the radial stress at the outer

*Developed according to E. Siebel and A. Pomp.[108]

[75] K. Musiol: Das Ziehen auf Ziehpressen in Theorie und Praxis; Dinglers polytechn. Jour. 315(1900)p.428.

[76] J. Blume: Ermittlung der Ziehfahigkeit von Tiefstanzblechen; Metallborse 12(1922)p.1945.

[77] W. Sellin: Die Berechnung von Ziehwerkzeugen; Maschinenbau 3(1924) p.229.

[78] M. Sommer: Versuche uber das Ziehen von Hohlkorpern; Forsch. -Arb. No. 286(1926).

[79] E. Ruhrmann: Bordeln und Ziehen in der Blechbearbeitungstechnic; Forsch. -Arb. No. 277(1926).

[80] C. L. Eksergian: Das bildsame Verhalten beim Ziehm; Met. Ind. 30 (1927)p.405.

[81] E. Siebel: St. u. E. 47(1927)p.1340.

*According to the shear stress theory, no deformation can be expected normal to the outer surface, because the blank beyond the edge of the matrix die remains under tangential compressive stress and radial tensile stress during the drawing.

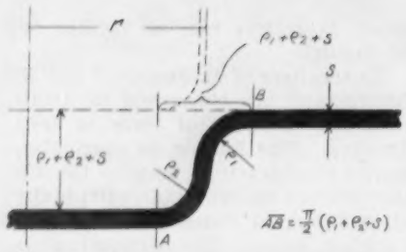

Fig. 108—Effect of fillets on forming die and drawing edge

edge ($x=R$) must be equal to zero. At the corner of the matrix die ($x=r$), the radial stress is found to be:

$$\sigma_r \ (x=r) = \int_r^R k_r \times \frac{dx}{x} \quad \text{.....(55).}$$

A numerical investigation can be carried out, in which the disk is subdivided into narrow rings having outer and inner radii of R and x_1, x_1 and x_2, - - - - x_n and r (Fig. 107), of which the momentary deformation strengths k_{r_1}, k_{r_2}, - - - - k_{r_r} must be known. The relation then is obtained:

$$\sigma_r \ (x=r) = k_{r_1} \log_e \frac{R}{x_1} + k_{r_2} \log_e \frac{x_1}{x_2} + \text{.....} + k_{r_r} \log_e \frac{x_n}{r} \text{....(55a).}$$

The radial stress at the drawing edge (edge of the matrix die) of radius r, however, can be determined with sufficiently close approximation, based upon a mean deformation strength in the entire ring which is established as the arithmetical mean of the deformation strength at the drawing edge and that at the outer edge. Equation (55) then takes the form:

$$\sigma_r \ (x=r) = k_{r_m} \times \log_e \frac{R}{r} \quad \text{.....(55b).}$$

The drawing force P_{id} for the ideal deep-drawing process (without loss) can be calculated from the radial stress at the drawing edge by multiplying this stress by the area of the sheet at this point. The equation accordingly is obtained:

$$P_{id} = 2\pi r \times s \times k_{r_m} \times \log_e \frac{R}{r} \quad \text{.....(56).}$$

The average deformation strength k_{r_m} is a function of the deformation occurring in the sheet at the outer edge and at the drawing edge. These, however, can be calculated in a relatively simple manner in relation to the depth of draw, if the small change of sheet thickness is neglected, and if the area of the sheet is assumed to be constant. If the drawn material is displaced at the drawing edge by the amount of the inward extension h', the momentary radius, R, at the outer edge, based upon the condition of constancy of area resulting from constant sheet thickness, is given by the relation:

$$\pi \times R_o^2 - \pi \times R^2 = 2\pi r \times h'$$
$$R = \sqrt{R_o^2 - 2r \times h'} \text{..(57),}$$

in which R_o represents the radius of the blank. The momentary deformation at the outer edge accordingly amounts to:

$$\varphi_R = \log_e \frac{R_o}{R} = \frac{1}{2} \log_e \frac{R_o^2}{R_o^2 - 2rh'} \text{.(58).}$$

In a similar manner, the original radius x_o of the portion within the drawing edge can be calculated as:

$$\pi \times x_o^2 - \pi \times r^2 = 2\pi r \times h'$$
$$x_o = \sqrt{r^2 + 2r \times h'} \quad \text{.....(59),}$$

and the deformation φ_r at the drawing edge is given as:

$$\varphi_r = \log_e \frac{x_o}{r} = \frac{1}{2} \log_e \frac{r+2h'}{r} \quad \text{.....(60).}$$

Because of the fillets of radii ρ_1 at the drawing edge and ρ_2 on the punch, the movement (h) of the punch and the displacement of material (h') at the drawing edge are not precisely equal. Instead, as shown in Fig. 108, when the punch travels a distance, $h=\rho_1+\rho_2+s$, the displacement which occurs at the drawing edge is only about:

$$h' = (\rho_1+\rho_2+s)\left(\frac{\pi}{2}-1\right)$$
$$= 0.57(\rho_1+\rho_2+s).*$$

In the further course of drawing, the relation then exists:

$$h' = h + 0.57(\rho_1+\rho_2+s) - (\rho_1+\rho_2+s)$$
$$= h - 0.43(\rho_1+\rho_2+s)$$

until the outer edge of the disk reaches the beginning of the fillet at the drawing edge. In order to draw in the disk edge the distance

$$\rho_1 + \frac{s}{2}$$

corresponding to the fillet at the drawing edge, however, the punch must travel a distance equal to about

$$\frac{\pi}{2}\left(\rho_1 + \frac{s}{2}\right)\left(\frac{r+\frac{1}{2}\rho_1}{r}\right)$$

The movement of the punch is the greater, the larger is the fillet at the drawing edge.

With the relations previously described between the movement of the punch and the displacement at the drawing edge, as well as between the latter and the deformations at the edge of the disk and at the drawing edge, and finally, the position of the outer edge; the theoretical diagram of drawing force can be calculated for a deep-drawing operation, as soon as the deformation strength of the material in question is known as a function of the momentary deformation.

The theoretical work of deformation in deep drawing can be determined by measuring with a planimeter the force-travel diagram established in the manner already described. Its direct calculation, however, is more simple and accurate. According to Fig. 109, all ring-shaped elements of the disk of width dx, between the drawing edge and the edge of the disk, are transformed during deep-drawing from their initial length, $2\pi x$, to the length, $2\pi r$. The work of deformation expended thereby is given according to equation (18) as:

$$dA = 2\pi \times x \times s \times dx \times a$$

in which $a = \int_0^{\varphi} k_f \times d\varphi$ represents the work required for the described deformation in each unit of volume. The specific work of deformation, however, as was stated separately in Part I, section 4, can be represented in a given flow-curve for the material in question, as a function of the deformation φ. The total work of the frictionless drawing process then is given by the relation:

$$A_{id} = 2\pi s \int_r^{x_o} x \times dx (a)_o = \log_e \frac{x}{r}$$
.....(62)

This integral can be solved graphically. In addition, the small increase of area, or elongation, in the cylindrical shell of the drawn vessel, which usually is observed, may be considered by calculating the specific work of deformation (a) at any instant, instead of from zero to the deformation $\log_e \frac{x}{r}$, from zero to $\log_e \frac{x}{r} + \log_e \frac{s_o}{s}$, where s_o and s represent the sheet thickness before and after the draw.

As in all technical forming proc-

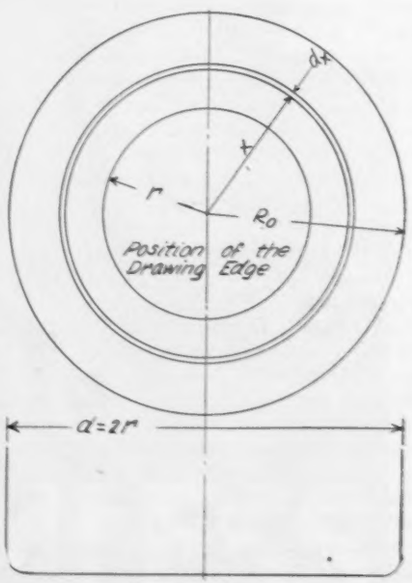

Fig. 109—Calculation of work of deformation in deep drawing

*An exact calculation of the relation between movement of the punch and edge displacement was made by M. Sommer[28].

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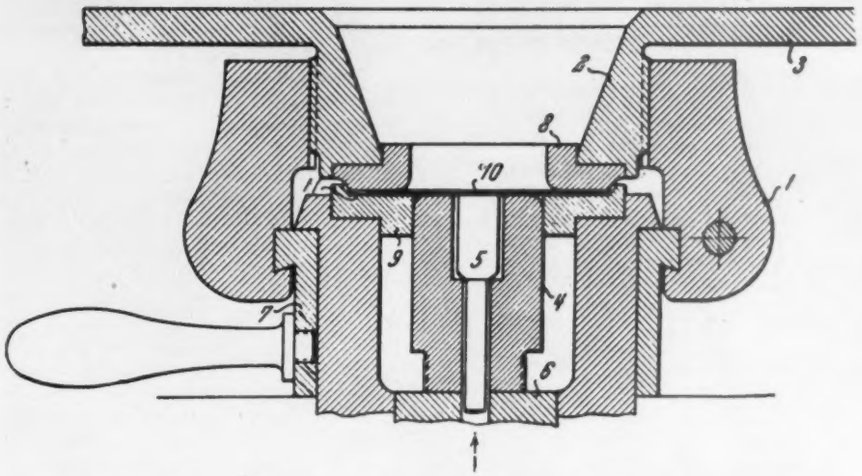

Fig. 110—*Construction of the drawing tool in the Guillery apparatus*

1. Clamping housing
2. Clamping head
3. Clamping shoulder
4. Punch
5. Ejector
6. Plunger
7. Bayonet lock
8. Drawing ring
9. Blank holder
10. Test piece
11. Centering ring

esses, the energy actually consumed during deep drawing is always greater than the theoretical energy requirement; inasmuch as forming losses occur here which are due primarily to the frictional forces originating from the pressure of the blank holder, and to the friction at the drawing edge. The force of the blank holder calls forth an additional force at the drawing edge, which corresponds approximately to 2 μ times the force, if μ represents the coefficient of friction between the drawn material and the blank holder or the drawing ring. Because of the friction at the drawing edge, the total forces and the work of drawing are increased by a factor

$$e^{\mu \frac{\pi}{2}}.$$

With $\mu = 0.1$, $e^{\mu \frac{\pi}{2}} = 1.17$; with $\mu = 0.2$, $e^{\mu \frac{\pi}{2}} = 1.37$;

that is, the losses at the drawing edge amount in the latter case to 37 per cent of the useful work of drawing, without regard to the work required to overcome the friction of the blank holder. These comparatively high values show that the greatest consideration must be given to the frictional relations at the drawing edge, if the forming losses are to be kept small[82].

The work of bending, which occurs during the sliding of the drawn material over the drawing edge, is classified as lost work. The sheet first becomes bent at each point as it approaches the drawing edge, corresponding to the curvature of the latter, and becomes straightened again as it moves on. Because all fibers of the sheet, as it approaches the drawing edge, become stretched by the drawing process itself, no effective forming losses occur at this point as a result of the bending. The work of bending here is independent of the curvature at the drawing edge, and already is considered if the drawing radius, r, in equations (55) and following, is taken as the radius of the drawing ring diminished by half of the thickness of the sheet.

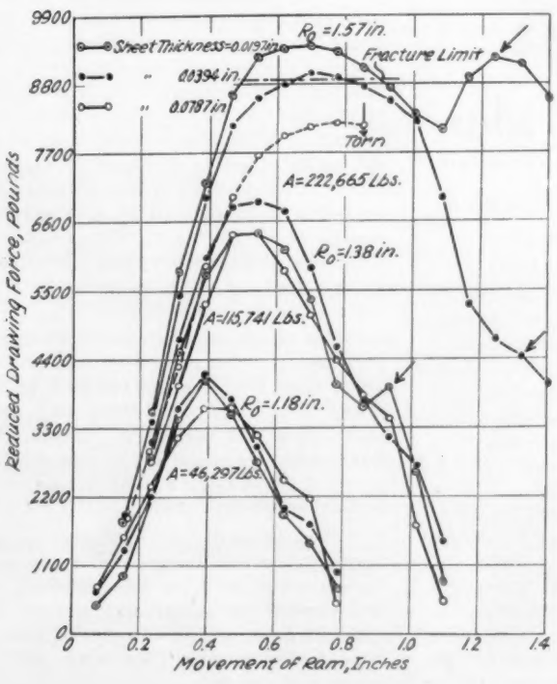

Fig. 111 — *Variation of drawing force during deep drawing, reduced to a sheet thickness of* 0.039-*inch* ($r = 0.807$-*inch*) *for steel A*

Work Considered As Lost

In the movement away from the drawing edge, however, the forming proper already is concluded. The work required for straightening therefore is evaluated as lost work. If the neutral fiber of a body element which is moving away from the drawing edge has a length dl in the radial direction, the corresponding fibers on the outer side, because of the curvature $\frac{1}{\rho_1}$ of the drawing edge, have a length $dl \times \frac{\rho_1 + s}{\rho_1 + \frac{s}{2}}$, and the fibers on the inner side have a length $dl \times \frac{\rho_1}{\rho_1 + \frac{s}{2}}$. In straightening, the fibers in the middle accordingly become compressed or stretched by an amount $dl \times \frac{4\rho_1}{s}$; and the work of deformation for the whole ring-shaped element, assuming pure plastic deformation with the deformation strength k_{f_r}, thereby amounts to:

$$dA = 2\pi \times r \times s \times dl \times \frac{s}{4\rho_1} \times k_{f_r}.$$

If the increase of the drawing force, which is required for the straightening, is designated as P_B, equating the

[82] H. Draeger: Der Einfluss der Rundung von Ziehring und Ziehstempel an Werkzeugen zum Ziehen von Blechhohlkorpern auf Ziehm von im Anschlag; Dr. -Ing. Dissertation, Technische Hochschule Dresden 1931; St. u. E. 51(1931)p.619; —E. Ackermann: Das Ziehen von Hohlkorpern aus Feinblechen unter besonderer Berucksichtigung der Blechhaltereinflusse; Berichte uber betriebswissensch. Arbeiten, vol. II(Berlin, VDI-Verlag 1929); St. u. E. 49(1929)p.1731.

internal and external work of forming gives the result:

$$P_B \times dl = 2\pi \times r \times s \times dl \times \frac{s}{4\rho_1} \times k_{f_r}$$

$$P_B = 2\pi \times r \times s \times k_{f_r} \times \frac{s}{4\rho_1} \quad \text{.....(63).}$$

The equation shows that the total drawing force is considerably increased because of the work of bending, whenever the fillet at the drawing edge is not made sufficiently large.

The ratio of the theoretical and actual expenditure of work during deformation can be designated as the deformation efficiency of the deep-drawing process. A series of drawing tests was carried out, in order to obtain conclusions regarding the magnitudes of the efficiency and of the losses, as well as concerning the exact course of the force travel diagram.

Tests Are Conducted

An experimental drawing apparatus by Guillery, with hydraulic feed of the punch and with two manometers for the measurement of force, was used for the execution of the tests. The drawing tool in this mechanism, as shown in Fig. 110, was similar to that applied by the General Electric Co. (German) to the testing of capacity for deep drawing[83]. The punch had a diameter of 1.57 inches. With this forming tool, disks of 2.36, 2.76 and 3.15 inches diameter were subjected to deep drawing, during which centering rings were used to assure that the section always was held in the proper position. The tests were conducted with sheets of 0.02, 0.04 and 0.079-inch thickness, and the drawing clearance in each case was maintained at about 0.004-inch. The fillets at the drawing edge and on the punch had radii of 0.197-inch.

Sheets of mild and hard steel were used for the tests. The strength of steel A amounted to about 44,100 pounds per square inch, and that of steel B was about 81,100 pounds per square inch. The strength properties in the three thicknesses investigated were approximately the same in each sort of steel.

During the drawing tests, the disks were lubricated on both sides with tallow, which gave the smallest value of drawing force in comparison with other lubricants. The drawing speed amounted to about 0.008-inch per second. The blank holder was drawn on securely by means of a clamping arrangement provided with the Guillery apparatus (Fig. 110). Various degrees of squeezing within the possible limits of holding stress, as was established by the tests, had only a slight influence upon the variation of the drawing force,

[83] Prufverfahren zur Wertung von Ziehblechen; AEG-Mitteilungen 1927, p.419.

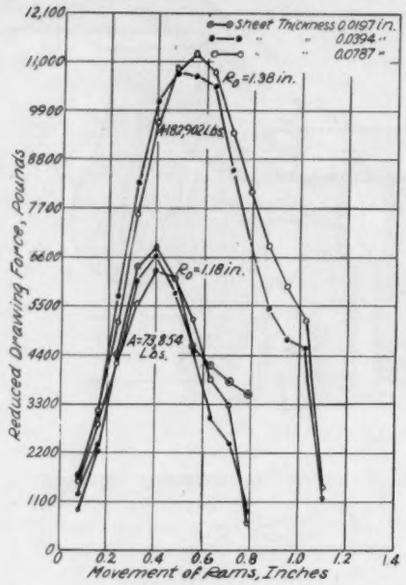

Fig. 112—Variation of drawing force during deep drawing, reduced to a sheet thickness of 0.039-inch ($r = 0.807$-inch) for steel B

as long as the formation of wrinkles was prevented to a sufficient extent. In order to permit a direct comparison of the drawing forces observed with different sheet thickness, the drawing forces were reduced to a sheet thickness of 0.039-inch dividing by the actual sheet thickness. The force-travel diagrams determined in this way for steel A are reproduced in Fig. 111, and those for steel B in Fig. 112. The drawing forces, reduced to equal sheet thicknesses, excluding the draws with a blank diameter of 3.15 inches which lie beyond the limits of the permissible forming, follow almost the same paths, regardless of the sheet thickness.

(To be continued)

Sees Era of Tailor-Made Steels

(Concluded from Page 16)

that steel must be merchandised. I could be shot at sunrise for saying that steel is becoming a young man's business, but I think it is true. You are to be treated to the spectacle of basic industries such as steel actually selling scientifically in the next 10 years, because the pioneer era in America is just about over."

Mr. Hamaker stated that by merchandising he does not mean selling alone or advertising specifically. "I mean starting the product from the raw material with the customer in mind—making what he needs and wants, not trying to force him to use what we find is most convenient to produce. That is what I mean by tailor-made steels."

"Many of our salesmen feel that they are not given sufficient opportunity to render the service they are equipped to provide. By this I mean advice on grades and finishes, and, in the case of alloy steels, on analyses and methods of heat treatment. Many steel salesmen today are equipped with both technical and practical training. They are able, if given an opportunity, to study, analyze and prescribe for the buyer's needs. Today, with the development of new alloys, new properties and new finishes in such numbers as to be confusing to almost anyone, the buyer has everything to gain and nothing to lose by taking the salesman of any good steel company into his confidence."

Illustrating this relation between buyer and producer, Mr. Hamaker recounted a story of Henry Ford. In a Florida road race in 1905, in which Ford was a contestant, a car of French make was badly wrecked. Ford noted while examining the wreckage that valves and other parts were smaller and lighter than anyone had dared to use in this country. He took some of the pieces to a laboratory, had them analyzed and found them to be chrome-vanadium steel . . . . "Ford began a weary round of the leading steelmakers to induce them to make such steel in commercial quantities in an open-hearth furnace at a commercial price. He met with nothing but refusal. Finally he came to a little steel company in Canton, O. . . . . After many failures the method was worked out and the commercial alloy steel industry was born."

Research Fathers Special Steels

"What happened thereafter is history and the little steel company for many years enjoyed practically every pound of Ford business and grew and prospered accordingly. . . . Hundreds of similar problems presented themselves as automobile designers outdid each other in developing faster, safer, stronger cars. There was no experience to go by and as a result research facilities were built up, on a scale that old-time tonnage steel companies had never dreamed of. The era of special steels began."

"The buyer of steel today receives and has a right to expect something more than the smelted product of so much iron ore, coke, limestone and scrap from his source of supply. He has a right to insist on expert metallurgical knowledge and advice as part of his steel purchases.

"The leopard has changed his spots and, speaking generally, we are trying very hard, as an industry, to live down the reputation gained in the old days of the industrial giants whose slogan was, 'We make steel; come and get it.' "

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ARMCO means GOOD IRON AND STEEL

Turret Lathe—Warner & Swasey Co., 5701 Carnegie avenue, Cleveland, recently placed on the market a high-speed turret lathe with a motor built into the head of the machine, and a new bar feed. The unit, shown below, is designed for high cutting speeds. It is particularly adapted to small diameter work and nonferrous materials, where high speeds necessitate high spindle revolution.

The machine incorporates a self-contained alternating-current motor drive, the rotor being mounted directly on the spindle, while the stator is in the head housing. Four speeds are available in either direction; 600, 1200, 1800 and 3600 revolutions per minute. All gearing and belts are eliminated.

High speeds made possible by the new lathe have necessitated a new combination of bar feed elements. For this purpose a friction finger bar feed has been developed, holding bars in a concentric position in the spindle to prevent vibration, and enclosing them for their full length in a protecting tube for safety.

The friction feed finger lies immediately behind the collet so that bar stock can be used up to the end. Finger is mounted on a feed tube, which, at the rear of the spindle, is reciprocated by a fork. Simple hand lever action and toggle linkage feed the stock, close the collet, and return the feed finger. The length of feed is controlled by a quickly set collar.

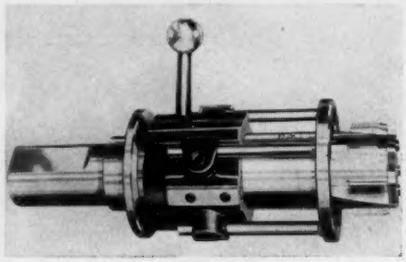
♦ ♦ ♦

Motor—Lincoln Electric Co., Colt and Kirby roads, Cleveland, is introducing a new self-protected motor that cannot burn out. The unit has a protective device built into the windings.

Where large motors are necessary to take care of only infrequent peak loads, a small size self-protected motor may be employed. At the high peak loads the protector will automatically disconnect the motor. Alternating-current induction self-protected motors are built in sizes from ½ to 30 horsepower, for either two or three-phase and standard commercial cycles and voltages.

♦ ♦ ♦

Collapsible Taps—Landis Machine Co., Waynesboro, Pa., recently brought out a new line of collapsible taps made in two types, style LT, shown herewith, and style LM. The former is a collapsible tool for either straight or taper tapping and the latter embodies a receding chaser collapsible type for taper tapping. They can be used as either stationary or rotary taps.



Landis style LT collapsible tap for straight or taper tapping

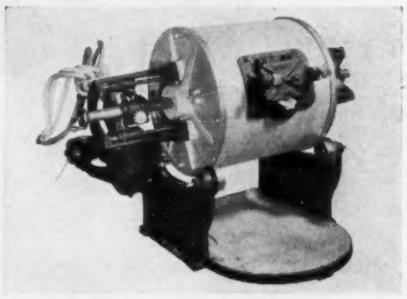
The outstanding feature is a design whereby the tap consists of two units; a tap body containing the operating mechanisms, and a tap head in which the chasers are supported. This design permits the use of one tap body to cover a wide diametrical range by the application of tap heads of various sizes. In addition, the same tap body may be used for either right or left-hand tapping, providing right and left-hand tap heads are employed.

Tap heads are adjustable for size through an adjusting screw located in the front end of the plunger. The screw is self-locking and is of the ratchet type so that a turn of the screw of one notch gives an adjustment to the chasers amounting to exactly 0.001-inch. Chasers are supported in slots in the tap head and are held securely in tapered seats in a hardened and ground plunger. Style LT taps are made in five sizes which, when equipped with the proper tap heads, cover a combined range from 1¼ to 13¼ inches inclusive. Style LM taps are also made in five sizes covering a combined range from 1¼ to 12-inch pipe, or 1½ to 13⅜ inches diameter.

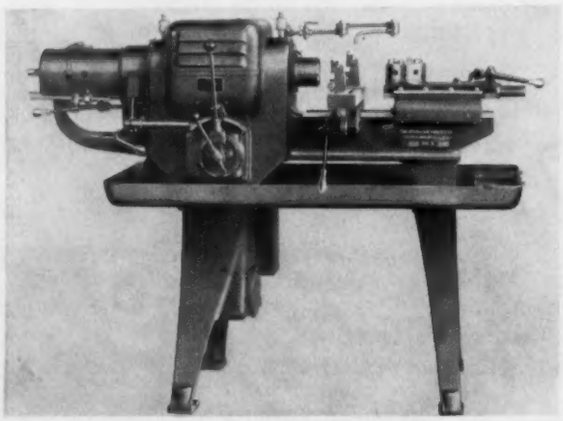
♦ ♦ ♦

Electric Furnace—Detroit Electric Furnace Co., Detroit, recently developed a rocking electric furnace of 25 to 100 pounds capacity. The unit shown herewith, has been designed for either production or experimental melting of small lot runs of metals, such as iron, alloy steel, copper, brass, nickel, aluminum or precious metals.

Interest of college engineering shops and laboratories in recent metallurgical developments has prompted the production of this small furnace as a part of the company's standard line. Since the first of these furnaces was built many production and jobbing foundry superintendents and metallurgists have employed these units as a pilot implement to direct large production runs, as well as for quick special heats of 50 to 100 pounds. The furnace is completely equipped with transformer, control panel, switches, meters and rocking mechanism. It has a nominal electrical rating of 20 kilowatts and may be connected to any industrial power supply.



Rocking electric furnace developed by Detroit Electric Furnace Co.

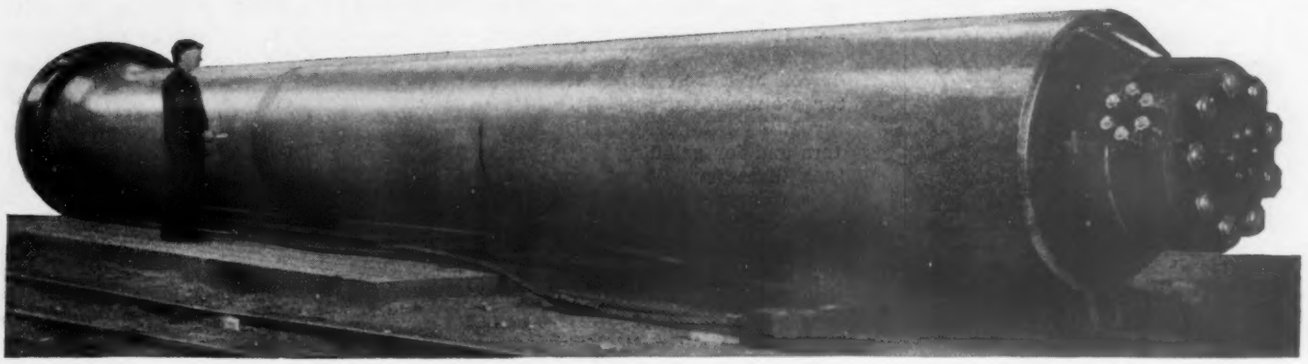


TWO levers responding instantly to finger tip pressure control the spindle electrically through a drum type controller and automatic relays in this Warner & Swasey high-speed turret lathe. The shorter lever selects the four spindle speeds; the longer lever stops, starts and reverses

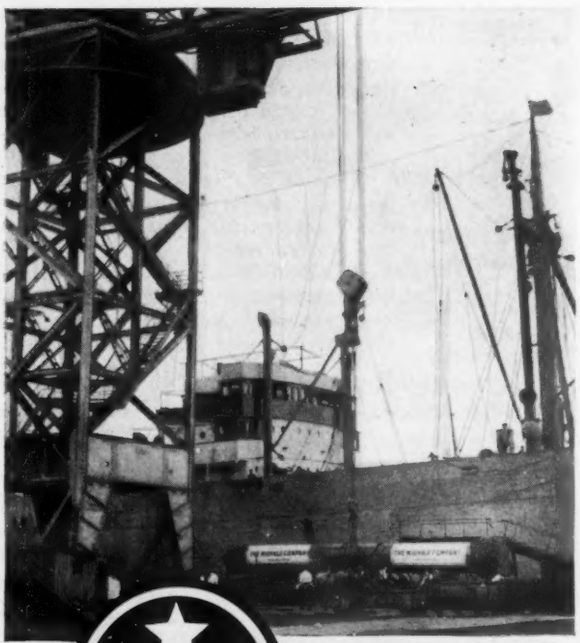
♦ ♦ ♦

Diesel Locomotive—Whitcomb Locomotive Co., Rochelle, Ill., recently shipped to Puerto Rico a 12-ton 0-4-0

THE SUNRISE KINGDOM CAME TO MIDVALE FOR THIS GIGANTIC SEAMLESS VESSEL



THERE is a sturdy practicality to our small brothers over the sea. They were never fooled by price. Because a thing cost more it was not necessarily better. Because a thing cost less it was not necessarily cheaper. The acid test of common sense and *use* has always been their measuring stick.



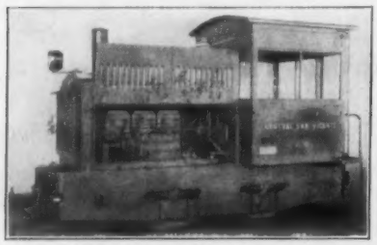
It is significant that in the purchase of this tremendous vessel, designed by the Nitrogen Engineering Corporation, the Sumitomo Fertilizer Works of Japan came to Midvale. A special crane was required to load this 90-ton monster on shipboard.

Modern industry requires such vessels in great variety. Midvale offers an experience in their manufacture for specific use available in few other places.

THE MIDVALE COMPANY, NICETOWN, PHILADELPHIA

New York Washington Pittsburgh Cleveland Chicago San Francisco

locomotive with mechanical drive. The unit, shown herewith, is equipped with a 6-cylinder diesel engine rated at 85 horsepower at 1200 revolutions per minute. It will haul 324 trailing tons up to 10.82 miles per hour and



Whitcomb locomotive equipped with 6-cylinder diesel engine

190 tons up to 16.87 miles per hour, thus affording a wide range of effectiveness for industrial haulage. It can be built for any track gage from 30-inches up. Transmission is by selective gears with four speeds forward and four speed reverse. The frame is a unit casting with integral engine and transmission mountings.

This series of diesel-powered locomotives ranges from 8 tons to 30 tons with mechanical drive, and from 30 tons to 60 tons with electric drive. In the larger sizes, designed for railroad and heavy industrial service, two engines are used per locomotive, each engine driving a generator. Swivel trucks each carry two motors geared directly to the axles.

♦ ♦ ♦

Gearmotors—Reliance Electric & Engineering Co., 1042 Ivanhoe road, Cleveland, recently added single reduction units to its line of gearmotors. These are used for ratios to 6:1 inclusive, and can be furnished with both alternating-current and direct-current motors of various types in sizes rated ¾ horsepower and up. Multispeed and adjustable-speed motors may be employed. Entire reduction is obtained in a single pair of gears.

♦ ♦ ♦

Magnetic Starter—Electric Controller & Mfg. Co., 2700 East Seventy-ninth street, Cleveland, has developed a No. 2 type ZOS oil-immersed, across-the-line combination magnetic starter for motors up to 30 horsepower, 220 volts; 60 horsepower, 440 volts and 75 horsepower, 550 volts. Although designed for the severe service encountered in mill duty, these starters are exceptionally small and narrow. They are particularly desirable for mounting in restricted spaces such as between flanges of columns, for mounting on motor-driven machines or grouping closely along a wall.

♦ ♦ ♦

Grinder — Hammond Machinery Builders Inc., Kalamazoo, Mich., has announced a new model 2-CW tool and production grinder, shown herewith. This unit was designed for one of the large automobile manufacturers. Spindle is mounted on oversize ball or roller bearings and driven by V-belts from standard motor mounted in rear. It is designed for 1, 1½, 2 and 3 horsepower motors and for grinding wheels up to 14 inch diameter. It is furnished with an oiling system consisting of an oil pump driven by means of worm gears from the spindle, pumping oil through a filter and supplying a continuous stream of filtered oil to bearings. Possibility of abrasive or other foreign matter getting into the oil

Tool and production grinder built by Hammond Machinery Builders

is eliminated. Work rests are rigid and provided with removable wearing plates. Cast steel or boiler plate wheel guards can be furnished together with safety glass eye shield.

♦ ♦ ♦

Drills—Armstrong Bros. Tool Co., 317-357 North Francisco avenue, Chicago, has added star drills to its line of tools. They are drop forged from high carbon chisel steel, hardened and tempered. Shanks are of proper stiffness to prevent bending. All sizes are available including 8, 12, 18 and 24-inch lengths made in diameters from ¼ to 1 by sixteenth inches; large diameters from 1 to 1½ come by eighths in 12, 18 and 24-inch lengths. These drills are of the four-point type.

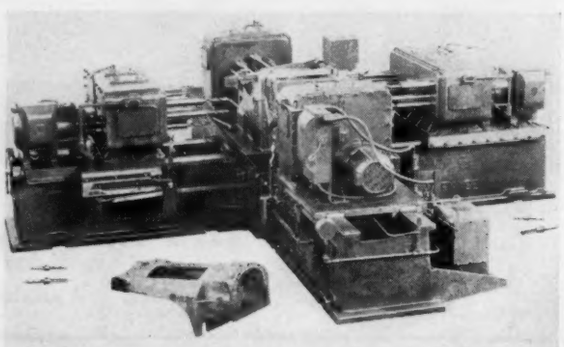
♦ ♦ ♦

Fuel Oil Heater—Griscom-Russell Co., 285 Madison avenue, New York, is marketing a new type of fuel oil heater consisting of two parallel steel pipes, each serving as a shell for a single G-fin pipe with a return bend at one end and all inlet and outlet connections at the other end. The G-fin pipes have an exterior surface more than eight times the area of the interior cylindrical surface. Heat is transferred from the steam which is contained inside the G-fin pipe to the oil flowing along the finned surface.

♦ ♦ ♦

Drilling, Reaming Machine—Defiance Machine Works, Defiance, O., has developed a new four-way horizontal drilling and reaming machine equipped for drilling and reaming 53 holes in main front tractor frames. To the center member of the base are attached four separate members that carry the slides upon which the multiple spindle heads and motors are mounted. The unit, shown herewith, can be built with any number of heads or spindles in heads to suit requirements. Fixture is removable, is of box type and equipped with guide bushings for drilling and reaming tools, with quick-acting screw clamps for locating and holding the frames in position. The design embodies two separate hydraulic pumps and cylinders for feed under each head. Each pump drives the two opposed heads and the machine is so arranged that either two or four heads are in work at the same time.

FOUR-WAY horizontal drilling and reaming machine developed by Defiance Machine Works. The number of heads or spindles in heads furnished depends on requirements. The unit depicted drills and reams 53 holes



ADVERTISING PAGES REMOVED

Demand Strong, but Rise in Rate Is Slower

Rail, Structural, Tin Plate Tonnages Heavier—Automotive Specifications Slacken as Prices Are Reaffirmed—February Daily Iron Output Up 15 Per Cent

STEEL production continues to rise, more rail tonnage has been placed, structural awards have rebounded, and tin plate mill operations have been lifted another ten points to 80 per cent.

On the surface, the market situation has lost none of its strength, and the steel trade still is confident that over the remainder of the first quarter and through the second quarter sufficient tonnage will emanate from automotive, railroad and seasonal construction work to give further momentum to steel output. Underneath, however, is an occasional undercurrent of uncertainty, arising mainly out of the NRA's future labor policies.

Labor difficulties in the automotive industry are being smoothed out almost as soon as they occur, and automobile manufacturers are increasing production schedules. Though consumption in this field continues upward, the extension of steel prices for second quarter has removed the incentive to stock material. Specifications have slackened, and some mills that withdrew recently from the market for automobile sheets now are prepared to take additional tonnage for delivery this month.

Steelmakers View Pause in Rate's Ascension As Temporary "Breathing Spell"

The net result has been to flatten out the curve of steelworks operations, the national rate last week rising only 1 point to 48 per cent. A year ago—almost to a day—when the new administration was taking hold at Washington, the rate was 15 per cent, and the country was heading into the banking holidays. In the month just past steel tonnage booked by leading interests was double that of January, and there is strong expectation on their part for doubling the February volume in March. By retrospect, therefore, as well as in the forward view, steelmakers feel much encouraged.

Steel production and shipments this month will more closely reflect actual consumer demand, as an artificial stimulus has not been supplied through price advances. On practically all products, prices at which users may now contract for second quarter have been reaffirmed. Recent reductions in hot-rolled strip and in so-called "Ford special" sheets have been canceled.

Including 29,000 tons of rails and 6370 tons of track fastenings placed by the Chicago & North Western, rail orders for the week totaled 39,000 tons; and fastenings, 8170 tons. Erie's application to the interstate commerce commission to spend PWA funds already allotted reveals its purpose to buy 42,121 tons of rails, and 12,340 tons of fastenings. Pennsylvania railroad has ordered 7000 tons of cast steel underframes for 500 flat cars. Railroad material releases have expanded.

Scrap Composite Highest Since Fall of 1930; Net Gain of Four in Active Blast Furnaces

Structural awards for the week, 23,721 tons, were nearly double the preceding week, topped by 12,300 tons for the superstructure of the Manhattan, New York, postoffice. Bids are being taken this week on 5000 tons for the Camden, N. J., approach to the high-speed line over the Delaware river bridge at Philadelphia; and on 4500 tons for a bridge at Omaha. Pittsburgh interests expect to share in this country's portion—6000 tons—of a 40,000-ton pipe order from Russia.

Scrap prices continue their steady ascent, mainly due to scarcity and prospective demand, STEEL's composite again moving up 30 cents to $12.25, highest since Oct. 8, 1930. A southern steelworks is reported to have purchased 40,000 tons of old rails from Seaboard Air Line and Atlantic Coast Line.

Daily average pig iron production in February, 45,426 gross tons, was up 15.3 per cent from January, and largest since last September with 50,264 tons. Despite the fewer number of days, total output—1,271,935 tons—was 3.7 per cent higher than in January. Ninety stacks were at the close of the month, a net gain of four.

Steelworks operations last week advanced 8 points to 77 per cent at Wheeling; 2 to 79, Cleveland; 5 to 52, Buffalo; 3 to 31, Pittsburgh; and ½ to 30, eastern Pennsylvania. They declined 14 points to 65 in New England; 2 to 52 at Youngstown; and were unchanged at 79, Detroit; 44, Chicago; and 52, Birmingham.

STEEL's iron and steel price composite remains $32.40; and finished steel $51.10.

COMPOSITE MARKET AVERAGES

	March 3	Feb. 24	One Month Ago Feb., 1934	Three Months Ago Dec., 1933	One Year Ago March, 1933	Ten Years Ago March, 1924
Iron and Steel Composite	$32.40	$32.40	$32.42	$32.42	$28.35	$43.24
Finished Steel Composite	51.10	51.10	51.10	51.10	45.60	67.18
Steelworks Scrap Composite	12.25	11.95	11.72	10.12	6.47	16.98

Iron and Steel Composite:—Pig iron, billets, slabs, sheet bars, wire rods, tin plate, nails, sheets, plates, shapes, bars, and black pipe. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

A COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

	Mar. 3, 1934	Feb. 1934	Dec. 1933	Mar. 1933
Finished Material				
Steel bars, Pittsburgh	1.75	1.75	1.75	1.60
Steel bars, Chicago	1.80	1.80	1.80	1.70
Steel bars, Philadelphia	2.04	2.04	2.04	1.91
Iron bars, Terre Haute, Ind.	1.60	1.60	1.60	1.65
Shapes, Pittsburgh	1.70	1.70	1.70	1.60
Shapes, Philadelphia	1.90	1.90½	1.90½	1.65
Shapes, Chicago	1.75	1.75	1.75	1.70
Tank plates, Pittsburgh	1.70	1.70	1.70	1.60
Tank plates, Philadelphia	1.88	1.88½	1.88½	1.59½
Tank plates, Chicago	1.75	1.75	1.75	1.70
Sheets, No. 10, hot rolled, Pitts.	1.75	1.75	1.75	1.55
Sheets, No. 24, hot ann., Pitts.	2.25	2.25	2.25	2.00
Sheets, No. 24, galvan., Pitts.	2.85	2.85	2.85	2.60
Sheets, No. 10, hot rolled, Gary	1.85	1.85	1.85	1.70
Sheets, No. 24, hot anneal., Gary	2.35	2.35	2.35	2.10
Sheets, No. 24, galvan., Gary	2.95	2.95	2.95	2.70
Plain wire, Pittsburgh	2.20	2.20	2.20	2.10
Tin plate, per base box, Pitts.	5.25	5.25	5.25	4.25
Wire nails, Pittsburgh	2.35	2.35	2.35	1.85
Semifinished Material				
Sheet bars, open-hearth, Youngs.	26.00	26.00	26.00	26.00
Sheet bars, open-hearth, Pitts.	26.00	26.00	26.00	26.00
Billets, open-hearth, Pittsburgh	26.00	26.00	26.00	26.00
Wire rods, Pittsburgh	36.00	36.00	36.00	35.00

	Mar. 3, 1934	Feb. 1934	Dec. 1933	Mar. 1933
Pig Iron				
Besemer, del. Pittsburgh	19.26	19.26	19.26	15.76
Basic, valley	17.00	17.00	17.00	14.00
Basic, eastern, del. eastern Pa.	18.76	18.76	18.76	13.50
No. 2 foundry, del. Pittsburgh	18.76	18.76	18.76	15.76
No. 2 foundry, Chicago	17.50	17.50	17.50	15.50
Southern, No. 2, Birmingham	13.50	13.50	13.50	11.00
No. 2X, Eastern, del. Philadelphia	19.63	19.63	19.63	13.76
Malleable, valley	17.50	17.50	17.50	14.50
Malleable, Chicago	17.50	17.50	17.50	15.50
Lake Superior charcoal, del. Chi.	23.54	23.54	23.54	23.04
Gray forge, del. Pittsburgh	18.38	18.38	18.38	15.63
Ferromanganese, del. Pittsburgh	90.24	90.24	87.24	73.24
Scrap				
Heavy melting steel, Pittsburgh	$14.25	13.90	12.20	8.75
Heavy melting steel, eastern Pa.	11.75	11.75	10.25	6.50
Heavy melting steel, Chicago	12.00	10.90	9.00	5.25
No. 1 wrought, eastern Pa.	12.75	12.75	11.00	6.75
No. 1 wrought, Chicago	10.65	10.50	8.45	5.00
Rails for rolling, Chicago	12.75	11.90	10.35	7.95
Coke				
Connellsville, furnace, ovens	3.50	3.50	3.75	1.75
Connellsville, foundry, ovens	4.25	4.25	4.25	2.25

Steel, Iron, Raw Material and Metals Prices

Prices conform to American Iron and Steel institute schedules. Asterisks denote price changes this week

Sheet Steel

HOT ROLLED No. 10
(24 to 48 inches wide)

Pittsburgh, base	1.75c
Gary, base	1.85c
Chicago, del.	1.88c
New York, del.	2.08c
Philadelphia, del.	2.04c
Birmingham, base	1.90c
St. Louis, del.	2.07c
F.o.b. cars, dock, Pacific ports	2.42½c

HOT ROLLED ANN. No. 24

Pittsburgh, base	2.25c
Gary, base	2.35c
Chicago, del.	2.38c
Detroit, del.	2.45c
New York, del.	2.58c
Philadelphia, del.	2.54c
Birmingham, base	2.40c
St. Louis, del.	2.57c
F.o.b. cars, dock, Pacific ports	2.95c

GALVANIZED No. 24

Pittsburgh, base	2.85c
Gary, base	2.95c
Chicago, del.	2.98c
Philadelphia, del.	3.14c
New York, del.	3.18c
Birmingham, base	3.00c
St. Louis, del.	3.17c
San Francisco, f.o.b. cars, dock	3.55c

TIN MILL BLACK No. 28

Pittsburgh, base	2.65c
Gary, base	2.75c
St. Louis, del.	2.97c

COLD ROLLED No. 10

Pittsburgh, base	2.30c
Gary, base	2.40c
Detroit, delivered	2.50c
Philadelphia, del.	2.59c
New York, del.	2.63c

COLD ROLLED No. 20

Pittsburgh, base	2.75c
Gary, base	2.85c
Detroit, delivered	2.95c
Philadelphia, del.	3.04c
New York, del.	3.08c

ENAMELING SHEETS

Pittsburgh, No. 10	2.45c
Pittsburgh, No. 20	2.90c

Tin and Terne Plate

Per 100-lb. box, Pittsburgh. Gary base, 10 cents higher

Tin plate, coke base contract	$5.25
Do., stock	4.55
Long ternes, No. 24 unassorted	3.25c

Corrosion and Heat Resistant Alloys

Base, Pittsburgh

18% chrome, 8% nickel; sheets, 35c; plates, 28c; bars, 24c; hot-rolled strip, 24.50c; cold-rolled strip, 32.00c.

	A	B	C	D
Bars	17c	18.5c	21c	26c
Plates	20c	21.5c	24c	29c
Sheets	25c	28c	31c	35c
Hot strip	17c	18.5c	21c	26c
Cold strip	22.5c	24c	27c	35c

Carbon 0.12 and under; no nickel. A has chrome 15% and under. B over 15/18% inc., C over 19/23% inc., D over 23/30%.

Steel Plates

Pittsburgh, base	1.70c
New York, del.	1.98c
Philadelphia, del.	1.88½c
Boston, del.	2.10c
Buffalo, del.	1.93½c
Chicago, base	1.75c
Cleveland, del.	1.88½c
Birmingham, base	1.85c
Coatesville, base	1.80c
Sparrows Pt., base	1.80c
Pacific Coast, f.o.b. cars, dock	2.25c
St. Louis, del.	1.97c

Structural Shapes

Pittsburgh, base	1.70c
Philadelphia, del.	1.90½c
New York, del.	1.95½c
Boston, del.	2.08½c
Bethlehem, base	1.80c
Chicago, base	1.75c
Cleveland, del.	1.88½c
Buffalo, base	1.80c
Birmingham, base	1.85c
Pacific Coast, f.o.b. cars, dock	2.25c

Bars

SOFT STEEL

Pittsburgh, base	1.75c
Chicago, base	1.80c
Birmingham, base	1.90c
Buffalo, base	1.85c
Cleveland, base	1.80c
Detroit, del.	1.90c
Pacific Coast ports, cars, dock, c.i.f.	2.30c
Philadelphia, del.	2.04c
Boston, del.	2.15c
New York, del.	2.08c
Pitts., forg. qual.	1.75c-2.25c

RAIL STEEL
To Manufacturing Trade

Pittsburgh	1.65c
Chicago	1.70c
Cleveland	1.70c
Gary, Ind.	1.70c
Buffalo	1.75c

IRON

Terre Haute, Ind. base 1.60c
Philadelphia, base.. 1.74c
Pittsburgh, refined.. 2.75c-7.50c

REINFORCING

New billet, cut lengths, carlots

Pittsburgh 1.90c
Chicago, Gary, Buffalo, Cleve., Birm., Young... 1.95c
Gulf ports 2.30c
Pacific coast ports 2.45c
Philadelphia, del. 2.19c

Rail Steel

Pittsburgh, base 1.75c
Chicago, Buffalo, Cleveland, Birm., Young. 1.80c
Gulf ports 2.15c
Pacific coast ports 2.30c

Wire Products □ □

(Prices apply to straight or mixed carloads; pool cars, or less, 10c up. 10% dis. on nail extras on straight or mixed carloads to one consignee.)

Base, Pittsburgh-Cleveland

(Per 100-lb. keg)

Standard wire nails $2.35
Cement coated nails 2.35
Galvanized nails, 15 gage and coarser 4.35c
Do., 16 gage and finer.. 4.85c

(Per pound)

Polished staples 3.05c
Galvanized fence staples 3.30c
Barbed wire, galv. 2.85c
Annealed fence wire 2.35c
Galvanized fence wire.... 2.70c
Woven wire fencing (base column, c.l.).....$60.00
Plain wire, 6-9 gage to mfg. trade 2.20c

Anderson, Ind., Chicago up $1; Duluth up $2; Birmingham up $3.

Spring wire 3.20c

Chicago and Waukegan $1 higher, Worcester $2 higher.

Cold-Finished Carbon Bars

Base Pitts., one size, shape, grade, shipment at one time to one destination

10,000 to 19,999 lbs..... 2.10c
20,000 to 59,999 lbs..... 2.05c
60,000 to 99,999 lbs..... 2.00c
100,000 lbs. and over.....1.97½c

Chicago, Cleveland, up 5c; Buffalo, up 10c; Detroit, up 20c; eastern Michigan, up 25c.

Shafting □ □ □

Turned and ground, Pitts. base

1⅛-inch 3.40c
1 7/16 to 1½-inch..... 2.90c
1 9/16 to 1 7/8-inch..... 2.75c
1 11/16 to 2 7/8-inch..... 2.60c
2 11/16 to 7-inch..... 2.45c

Alloy Steel Bars □

Hot Rolled

Pittsburgh, Buffalo, Chicago, Massillon, Canton 2.45c
Bethlehem 2.55c

Alloy S.A.E.	Diff.	Alloy S.A.E.	Diff.
2000	0.25	3100	0.55
2100	0.55	3200	1.35
2300	1.50	3300	3.80
2500	2.25	3400	3.20

4100 .15 to .25 Mo.....0.50
4600 .20 to .30 Mo. 125-1.75 Ni. 1.05
5100 .80-1.10 Cr.....0.45
5100 Cr. spring.....base
6100 bars 1.20
6100 spring 0.70
Cr., Ni., Van.....1.50
Carbon van. 0.95
9250.....carbon base plus extras

Strip and Hoops □

Hot strip to 23¾-in.
Pittsburgh 1.75c
*Do., Chicago 1.85c
Do., del. Detroit.. 1.95c
Do., del. Phila..... 2.04c
Do., del. N. Y..... 2.08c
Cooperage hoop,
Pittsburgh 1.85c
*Do., Chicago 1.95c
Cold-rolled strip,
Pitts., Cleve. 2.40c
Worcester 2.60c

Rails, Track Material □

(Gross Ton)

Standard rails, mill $36.37½
Relay rails. Pitts.
20-45 lbs. $26.00
50-60 lbs. $23.00
70-75 lbs. $18.00
80-85 lbs. $25.00
100 lbs. $26.00
Light rails, billet qual., Pitts., Chi. $32.00
Do., reroll. qual.... $31.00
Angle bars, mills... 2.55c
Spikes, R. R. base.. 2.40c
Track bolts, base.... 3.55c
Tie plates, base 1.90c

Base, light rails 25 to 40 lbs.; 50 to 60 lbs. inclusive up $5; 16 and 20 lbs., up $1; 12 lbs., up $2; 8 and 10 lbs., up $5. Base railroad spikes 200 kegs or more; base tie plates 20 tons or more; diff. for less.

Bolts and Nuts □ □

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade for all case lots. Dec. 1, 1932, lists.

CARRIAGE BOLTS

All sizes, cut thread.....70 off
Rolled thread, ½ x 6 and smaller .....70 off

MACHINE BOLTS

All sizes, cut thread, lag Screws, plow bolts, Nos. 1-2-3-7 heads, tap bolts, blank bolts, stud bolts, without nuts .....70 off
Tire bolts .....60 off
Stove bolts, 70-25-10 off in pkgs.; 83 off in bulk, 5000 or more of a size.
Rolled thread machine bolts, ½ x 6 and smaller, 70 off
Step bolts .....66 off
Elevator bolts .....66 off

NUTS

Semifinished .....70 off

HEXAGON CAP SCREWS

Milled .....80-10-10 off
Upset 1-in., smaller.....85 off

SQUARE HEAD SET Screws

Upset, 1-in., smaller....75-10 off
Upset, larger than 1-in.... ..... 75-10 off
Headless set screws.....75 off

Rivets, Wrought Washers

Struc., c.l., Pittsburgh, Cleveland 2.75c
Struc., c.l., Chicago 2.85c
⅞-in. and smaller, Pitts., Chi., Cleve..70 and 10 off
Wrought washers, Pitts., Chi., Phila..6.00-6.25 off

Cut Nails, Piling □

Cut nails, Pitts:; (10% discount on size extras) $2.75
Do. less carloads, 5 kegs or more; no discount on size extras $3.00
Do., less than 5 kegs; no discount on size extras $3.15
Steel piling, Pittsburgh.... 2.00c
Steel piling, Chi., Buff..... 2.10c

Pipe and Tubing

Base $200 net ton, except on standard commercial seamless boiler tubes under 2 inches and cold drawn seamless tubing.

Welded Iron, Steel Pipe

Base discounts on steel pipe, Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less. Chicago delivered 2½ points less. Wrought pipe, Pittsburgh base.

BUTT WELD

Steel

In.	Blk.	Gal.
¼ and ⅜	57	38½
½	62	50½
¾	65½	55½
1—3	67½	58½

Iron

½	31½	15
¾	36½	20½
1—1¼	39½	25½
2	41½	26

LAP WELD

Steel

2	63½	54½
2½—3	66½	57½
3½—6	68½	59½
7 and 8	67½	57½
9 and 10	67	57

Iron

2	37	22½
2½—3½	38	25
4—8	40	28½

LINE PIPE

Steel

⅛-inch, butt weld..... 50½
¼—⅜, butt weld..... 56
½, butt weld 61
¾, butt weld 64½
1—3, butt weld 66½
2-inch, lap weld 62½
2½—3, lap weld 65½
3½—6, lap weld..... 67½
7—8, lap weld 66½

Iron

⅛—1½-inch, black and galv. take 4 pts. over; 2½—6-inch 2 pts. over discounts for same sizes, standard pipe lists. 8—12-inch, no extra.

BOILER TUBES

C. L. Discounts, f.o.b. Pitts.

Lap Weld Steel		Charcoal Iron	
2—2¼	33	1¾	8
2½—2¾	40	2—2¼	13
3	47	2½—2¾	16
3¼—3¾	50	3	17
4	52	3¾—3½	18
4½—6	42	4	20
1½	1	4½	21

In lots of a carload or more, above discounts subject to preferential of two 5% discounts on steel and 10% on charcoal iron.

Lapwelded steel: Under 10,000 lbs., 6 pts. under base and one 5%; on 10,000 lbs. to carload, 4 pts. under base and two 5%. Quantity discounts same as for hot-rolled. Charcoal iron; Under 10,000 lbs., 2 pts. under base; on 10,000 lbs. to carload, base and one 5%.

SEAMLESS BOILER TUBES

Cold Drawn

2—2¼	27	3¼—3½	41
2½—2¾	34	4	46
3	38	4½, 5, 6	43

(On 1—1¾-inch sizes mechanical tubing dis. apply.)

Hot Rolled

2—2¼	33	3¼—3½	47
2½—2¾	40	4	49
3	44	4½, 5, 6	42

Quantity discounts: Under 10,000 lbs., 10 pts. and 5%; 10,000 to 24,999 lbs., 6 pts. and 5%; 25,000 lbs. to carload, 2 pts. and 5 and 5%; carload and over, base discount and 5 and 5%. No extra for lengths 24 ft. and under.

Seamless Tubing □

Cold drawn; f.o.b. mill disc.

100 ft. or 150 lbs..... 32%
15,000 ft. or 22,500 lbs..... 70%

Cast Iron Water Pipe □

Class B Pipe—Pet Net Ton

6-in., & over, Birm...$36.00-37.00
4-in., Birm. 39.00-40.00
4-in., Chicago 47.00-48.00
6 to 24-in., Chicago 44.00-45.00
6-in., & over, east. fdy. 40.00
Do., 4-in. 43.00

Class A pipe $3 over Class B.
Stnd. fitgs., Birm. base....$90.00

Six to 24-inch, fittings base; over 24-inch plus $20; 4-inch, plus $10; 3-inch, plus $20; gas pipe fittings, 5 higher.

Semifinished Steel □

Prices Per Gross Ton

BILLETS AND BLOOMS

4 x 4-inch base

Pitts., Chi., Cleve., open-hth. & bess. $26.00
Philadelphia 31.30
Forgings, Pitts., Chi. 31.00

SHEET BARS

Pitts.,Cleve., Young. 26.00
Chicago 26.00
Canton, O. 26.00

SLABS

Pitts.,Cleve., Young. 26.00

WIRE RODS

Pitts., Cleveland..... 36.00
Chicago 37.00

SKELP

All grades, Pitts., and Chicago 1.60c

Coke □ □ □

Price Per Net Ton

BEEHIVE OVENS

Connellsville fur. $3.50
Connellsville fdry.... 4.25
Connel. prem. fdry. 5.00- 5.25
New River fdry..... 6.00
Wise county fdry... 4.25- 5.00
Wise county fur..... 3.50- 4.25

BY-PRODUCT FOUNDRY

Newark, N. J., del. 8.71- 9.31
Chi., ov., outside del. 8.50
Chicago, del 9.25
New England, del... 10.50
St. Louis, del. 9.25
Birmingham, ovens 5.00
Indianapolis, del..... 8.75
Ashland, Ky., Connellsville basis..... 6.00
Portsmouth, ovens, Connellsville basis 6.00
Buffalo, ovens 7.50- 8.00
Detroit, ovens 8.00
Philadelphia, del..... 9.00

Coke By-Products □

Per gallon, producers' plants.

Tank lots

	Spot
Pure benzol	$0.205
90 per cent benzol..	$0.205
Toluol	0.30
Solvent naphtha.....	0.26
Commercial xylol....	0.26

Per lb. f.o.b. New York

Phenol (200 lb. drums).. 0.163c
Do. (100 lb.) 0.178c

Per lb., producers' plants

Naphthalene flakes and balls 6.00- 7.25
Per 100 lb. Atlantic seaboard
Sulphate of ammonia $1.25

Pig Iron

Delivered prices do not include switching charges except as noted. No. 2 foundry iron is 1.75-2.25 silicon; 25-cent differentials apply for each 0.25 silicon above 2.25. Gross tons.

	No. 2 Fdry.	Malleable	Basic	Bessemer
Basing Points:				
Bethlehem, Pa.	$18.50	$19.00	$18.00	$19.50
Birdsboro, Pa.	18.50	19.00	18.00	19.50
Swedeland, Pa.	18.50	19.00	18.00	19.50
Sparrows Point, Md.	18.50	.....	18.00	.....
From Swedeland, Pa., del. to Philadelphia	19.26	19.76	18.76	.....
From Bethlehem, del. to Brooklyn	20.77	21.27	.....	.....
From Bethlehem, del. to Newark, N. J.	19.99	20.39	.....	.....
Basing Point:				
Everett, Mass.	18.50	19.00	18.00	19.50
From Everett, del. to Boston	19.00	19.50	18.50	20.00
Basing Point:				
Buffalo	17.50	18.00	16.50	18.50
From Buffalo, del. to Boston	19.00	19.50	18.50	20.00
Basing Points:				
Neville Island, Pa.	18.00	18.00	17.00	18.50
Sharpsville, Pa.	17.50	17.50	17.00	18.00
Youngstown, O.	17.50	17.50	17.00	18.00
From Neville Island, Pa., del. to Pittsburgh district	(Neville Island base, plus 63c to $1.13 switching charges)			
Basing Points:				
Erie, Pa.	17.50	18.00	17.00	18.50
Cleveland	17.50	17.50	17.00	18.00
Toledo, O.	17.50	17.50	17.00	18.00
Detroit	17.50	17.50	17.00	18.00
From Detroit, del. to Saginaw, Mich.	19.60	19.60	19.10	20.10
From Cleveland, del. to Akron, Canton, O.	18.76	18.76	18.26	19.26
From Toledo, del. to Mansfield, O.	19.26	19.26	18.76	19.76
Basing Point:				
Jackson, O.	19.25	19.25	18.75	.....
Hamilton, O.	17.50	17.50	17.00	18.00
From Hamilton, del. to Cincinnati	18.51	18.51	18.01	19.01
Do., del. to Indianapolis	19.77	19.77	19.27	20.27
Basing Points:				
Duluth	18.00	18.00	.....	18.50
Chicago	17.50	17.50	17.00	18.00
Granite City, Ill.	17.50	18.00	17.00	.....
From Duluth, del. to St. Paul	19.94	19.94	.....	20.44
From Chicago, del. to Milwaukee	18.50	18.50	18.00	19.00
From Chicago, Toledo or Detroit, del. to Muskegon, Mich.	20.40	20.40	19.90	20.90
From Granite City, del. to St. Louis	18.00	18.50	17.50	.....
Basing Point:				
†Birmingham, Ala.	13.50	.....	12.50	.....
From Birmingham, del. to:				
Boston	18.62	.....	18.12	.....
Newark, N. J.	19.58	.....	.....	.....
Brooklyn, N. Y.	20.39	.....	.....	.....
Baltimore	19.02	.....	18.52	.....
Philadelphia	18.88	.....	18.38	.....
Cleveland	17.62	.....	17.50	.....
Cincinnati	18.13	.....	17.51	.....
Chicago	*17.72	.....	17.60	.....
St. Louis	17.62	.....	17.50	.....

†Southern delivery only. Prices at northern points are adjusted to quotations on northern iron. *Over 0.70 phos.

Basing Point:
Provo, Utah ..... 16.50 ....

LOW PHOS.

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.—$23.00. Basing point: Johnson City, Tenn.—$23.00
Philadelphia, standard and copper bearing 24.13

GRAY FORGE		CHARCOAL	
Valley furnace	17.25	Lake Superior fur.	20.50
Pitts. dist. fur.	17.75	Do., del. Chicago	23.54

SILVERY

Jackson county, O., base; 6%—$22.25; 7—$23.25; 8—$24.25; 9—$25.25; 10—$26.25; 11—$27.75.

BESSEMER FERROSILICON

Jackson County, O., base; 10%—$27.25; 11—$28.75; 12—$30.25; 13—$31.75; 14—$33.25; 15—$34.75; 16—$36.25.

Iron Ore

LAKE SUPERIOR ORE
Gross ton, 51½% Lower Lake Ports

Old range bess.	$4.30
Mesabi bessemer	4.65
Old range nonbess.	4.65
Mesabi nonbess.	4.50
High phosphorus	4.40

EASTERN LOCAL ORES
Cents, unit, del. E. Pa.

Foundry and basic, 56-63% con. (nom.)	8.00- 9.00
Cop.-free low phos. 58-65% (nom.)	10.00-10.50

FOREIGN ORE
Cents per unit, f.a.s. Atlantic ports (nominal)

Foreign manganiferous ore, 45.55% iron, 6-10% man.	10.00
No. Afr. & low phos.	9.50
Swedish basic, 65%	9.00
Swedish low phos.	9.50
Spanish No. Africa basic, 50 to 60%	9.00
Tungsten, spot, sh. ton unit, duty pd.	$14.00-14.25
N. F. fdy., 55%	7.00
Chrome ore 48% gross ton, c.i.f.	$18.00

Manganese Ore

(Nominal)

Prices, not including duty, cents per unit, cargo lots.

Caucasian, 52-55%	24.00
So. African, 52%	24.00
So. Afr., 49-51%	22.00
Indian, 58-50%	nominal
Indian, 48-50%	nominal

Refractories

Per 1000 f.o.b. Works

FIRE CLAY BRICK
First Quality

Pa., Ohio, Ill., Ky., Md., Ga., Mo.	$45.00
Alabama	48.00

Second Quality

Pa., Ohio, Ill., Ky., Md., Mo., Ga., Ala.	40.00

MALLEABLE BUNG BRICK

all bases	50.00

SILICA BRICK

Pennsylvania	$45.00
Joliet, E. Chicago	54.00
Birmingham, Ala.	52.00

MAGNESITE

Dead burned grain, Chester, Pa., Baltimore bases, net	40.00
Domes, Chewelah, Wash., base	22.00

BASIC BRICK
Net ton, f.o.b. Baltimore, Plymouth, Meeting, Pa., Chester, Pa.

Magnesite brick	$65.00
Chrome brick	45.00
Chemically bonded magnesite	55.00

Fluorspar 85-5

Washed gravel, duty paid, tide, gross ton	$21.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads	$14.75-15.00

Ferroalloys

Dollars, except Ferrochrome

Ferromanganese, 78-82% tidewater, duty paid	85.00
del. Pittsburgh	90.24
Spiegeleisen, 19-20%, dom., fur., spot†	26.00
Ferrosilicon, 50%, freight all., cl.	77.50
Do., less carload	85.00
Do., 75 per cent. Spot, $5 a ton higher.	126-130.00
Silicomang., 2½ carb	90.00
2% carbon	95.00
1% carbon	105.00
Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb. con. del.	10.00
Ferrotungsten, stand., lb. cont.	1.16- 1.25
Ferrovanadium, 35 to 40%, lb. cont., on analysis	2.70- 2.90
Ferrotitanium, c. l., prod. plant, frt. allow., net ton	137.50
Spot, 1 ton, frt., allow., lb.	7.00
Do., under 1 ton	7.50
Ferrophosphorus, per ton, c. l., 17-19%, Rockdale, Tenn., basis, 18%, $2 unitage	50.00
Ferrophosphorus, electrolytic, per ton c. l., 23-26% f.o.b. Anniston, Ala., 24% $2.75 unitage	65.00
Ferromolybdenum, stand. 50-60%, lb.	0.95
Molybdate, lb. cont.	0.80

†Carloads. Quan. diff. apply.

Nonferrous Mill Products

F.o.b. mill base, cents per lb. except as specified. Copper, brass products based on 8.25c Conn. copper

Sheets

Yellow brass (high)	13.75
Copper, hot rolled	15.00
Lead, cut, to jobbers	7.75
Zinc, 100-lb. base	9.00

Tubes and Pipes

High yellow brass	16.25
Seamless copper	16.25

Rods

High yellow brass	12.25
Copper, hot rolled	12.25

Anodes

Copper, untrimmed	12.75

Wire

Yellow brass (high)	14.25

Old Metals

Deal. buying prices, cents lb.

No. 1 Composition Red Brass	
New York	4.50- 4.75
Chicago	4.37½-4.87½
Cleveland	5.00- 5.25
St. Louis	4.75- 5.00
Heavy Copper and Wire	
New York	6.12½- 6.25
Chicago, No. 1	5.75- 6.00
Cleveland	5.50- 5.75
St. Louis	5.75- 6.00
Composition Brass Borings	
New York	4.25- 4.50
Light Copper	
New York	5.25- 5.50
Chicago	4.50- 4.75
Cleveland	5.00- 5.25
St. Louis	4.75- 5.00
Light Brass	
Chicago	2.50- 2.75
Cleveland	3.00- 3.25
Lead	
New York	3.00- 3.25
Cleveland	2.75- 3.10
Chicago	2.75- 3.00
St. Louis	3.10- 3.25
Zinc	
New York	2.25- 2.50
Cleveland	2.25
Chicago	2.25- 2.50
*St. Louis	2.75- 3.00
Aluminum	
*Clips, soft, Cleve.	13.50-14.50
*Borings, Cleveland	7.00- 7.50
*Mixed, cast Cleve.	11.50-12.00
Mixed, cast St. L.	10.50-11.00

Secondary Metals

Brass ingot, 85-5-5-5	8.00
Remelt al. No. 12	15.50-16.00

Iron and Steel Scrap Prices

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated

HEAVY MELTING STEEL

Birmingham	9.50-10.50
Boston, dealers	8.00- 8.25
Buffalo, No. 1	12.00-12.25
Buffalo, No. 2	10.50-10.75
Chicago	11.75-12.25
Cleveland, No. 1	11.50-12.00
Cleveland, No. 2	11.00-11.50
Detroit, No. 1	10.25-10.75
Detroit, No. 2	9.25- 9.75
Eastern Pa.	11.50-12.00
Eastern Pa., No. 2	9.50-10.00
Federal, Ill.	9.00- 9.50
Granite City, Ill.	9.50-10.00
N. Y., deal. R. R.	9.00
N. Y., deal. No. 2	8.00
Pittsburgh, No. 1	14.00-14.50
Pitts., No. 1 (R. R.)	15.50
St. Louis, No. 1 del.	10.50-11.00
Valleys, No. 1	14.00-14.50

COMPRESSED SHEETS

Buffalo, dealers	10.50-10.75
Chicago, factory	10.50-11.00
Cleveland	11.00-11.50
Detroit	10.25-10.75
E. Pa., new mat.	10.50
Pittsburgh	14.00-14.50
Valleys	13.50-14.00

BUNDLED SHEETS

Buffalo	6.75- 7.25
Cincinnati, del.	6.50- 7.00
Cleveland	8.50- 9.00
Pittsburgh	12.50-13.00
St. Louis	5.75- 6.25

SHEET CLIPPINGS LOOSE

Chicago	6.00- 6.50
Cincinnati	6.00- 6.50
Detroit	7.50- 8.00
St. Louis	5.00- 5.50

STEEL RAILS, SHORT

Birmingham	11.00-12.00
Boston, dealers	7.75- 8.00
Buffalo	13.00-13.50
Chicago (3 ft.)	12.50-13.00
Chicago (2 ft.)	13.00-13.50
Cincinnati, del.	12.00-12.50
Detroit	11.25-11.75
Pitts., (open-hearth 3 ft. and less	15.50-16.00
St. Louis	12.50-13.00

STOVE PLATE

Birmingham	6.50- 7.50
Boston, dealers	4.75- 5.00
Buffalo	10.25-10.75
Chicago, net	7.50- 8.00
Cincinnati, dealers	6.50- 7.00
Detroit, net	6.50- 7.50
Eastern Pa.	8.50- 9.00
N. Y., deal. fdry.	6.00
St. Louis	6.50- 7.00

COUPLERS, SPRINGS

Buffalo	12.75-13.25
Chicago, springs	12.50-13.00
Eastern Pa.	15.00-15.50
Pittsburgh	15.50-16.00
St. Louis	12.00-12.50

ANGLE BARS—STEEL

Chicago	12.25-12.75
St. Louis	10.00-10.50

LOW PHOSPHORUS

Buffalo, billets and bloom crops	12.50-13.00
Cleveland, billet, bloom crops	14.00-14.50
Eastern Pa. crops	14.00-14.50
Pittsburgh, billet, bloom crops	16.50-17.00
Pittsburgh, sheet bar crops	15.50-16.00

FROGS, SWITCHES

Chicago	11.00-11.50
St. Louis	11.00-11.50

SHOVELING STEEL

Chicago	11.50-12.00
St. Louis	9.00- 9.50

RAILROAD WROUGHT

Birmingham	7.00- 8.00
Boston, dealers	6.00- 6.50
Buffalo, No. 1	9.25- 9.75
Buffalo, No. 2	12.00-12.25
Chicago, No. 1, net	9.25- 9.75
Chicago, No. 2	11.00-11.50
Cincinnati, No. 2	9.50-10.00
Eastern Pa.	12.50-13.00
N. Y., No. 1 deal	8.00- 8.50
St. Louis, No. 1	7.00- 7.50
St. Louis, No. 2	9.50-10.00

SPECIFICATION PIPE

Boston	4.50- 4.75
Eastern Pa.	10.00
New York, dealers	5.25- 5.50

BUSHELING

Buffalo, No. 1	10.50-10.75
Chicago, No. 1	10.25-10.50
Cinci., No. 1 deal	6.50- 7.00
Cincinnati, No. 2	2.50- 3.00
Cleveland, No. 2	9.00- 9.50
Detroit, No. 1 new	9.25- 9.75
St. Louis, No. 1	6.50- 7.00
Valleys, new No. 1	13.50-14.00

MACHINE TURNINGS

Bimingham	4.50- 5.00
Boston, dealers	4.00- 4.25
Buffalo	7.00- 7.50
Chicago	7.50- 8.00
Cincinnati, dealers	5.50- 6.00
Cleveland	8.75- 9.25
Detroit	7.25- 7.75
Eastern Pa.	7.00- 7.50
New York, dealers	3.25- 3.50
Pittsburgh	10.75-11.25
St. Louis	5.25- 5.75
Valleys	10.25-10.50

BORINGS AND TURNINGS

For Blast Furnace Use

Boston, dealers	3.25- 3.50
Buffalo	7.50- 8.00
Cincinnati, dealers	5.50- 6.00
Cleveland	9.00- 9.50
Detroit	7.75- 8.25
Eastern Pa.	6.00- 6.50
New York, dealers	2.00- 2.50
Pittsburgh	8.50- 9.00

CAST IRON BORINGS

Birmingham, plain	4.50- 5.00
Boston, chemical	8.50- 9.00
Boston, dealers	3.25- 3.50
Buffalo	7.50- 8.00
Chicago	7.00- 7.50
Cincinnati, dealers	5.50- 6.00
Cleveland	9.00- 9.25
Detroit	7.75- 8.25
E. Pa., chemical	12.00-15.00
New York, dealers	3.00- 3.50
Pittsburgh	8.50- 9.00
St. Louis	5.25- 5.75

PIPE AND FLUES

Cincinnati, dealers	4.50- 5.00

RAILROAD GRATE BARS

Buffalo	6.75- 7.25
Chicago, net	7.00- 7.50
Cincinnati	5.75- 6.25
Eastern Pa.	8.50- 9.00
New York, dealers	5.00- 5.50
St. Louis	5.50- 6.00

FORGE FLASHINGS

Boston, dealers	5.50- 5.75
Buffalo	10.50-10.75
Cleve., over 10 in.	9.25- 9.75
Detroit	8.50- 9.00

FORGE SCRAP

Boston, dealers	4.75- 5.00
Chicago, heavy	12.00-12.50
Eastern Pa.	10.50-11.00

ARCH BARS, TRANSOMS

St. Louis	10.50-11.00

AXLE TURNINGS

Boston, dealers	4.50- 5.00
Buffalo	9.00- 9.50
Chicago, elec. fur.	10.00-10.50
Cleveland	10.00-10.50
Eastern Pa.	11.00
St. Louis	6.00- 6.50

STEEL CAR AXLES

Birmingham	11.00-11.50
Boston, ship. point.	8.00- 8.50
Buffalo	12.25-12.75
Chicago, net	12.50-13.00
Eastern Pa.	14.00
St. Louis	11.50-12.00

SHAFTING

Boston, ship. point.	10.75-11.00
Eastern Pa.	16.25-16.50
New York, dealers	11.50-12.00
St. Louis	9.00- 9.50

CAR WHEELS

Birmingham, iron	9.00- 9.50
Boston, iron deal	6.50- 6.75
Buffalo, iron	11.75-12.25
Buffalo, steel	12.50-13.00
Chicago, iron	12.25-12.75
Chicago, rolled steel	12.50-13.00
Cincinnati, iron	9.25- 9.75
Eastern Pa., iron	13.50-14.00
Eastern Pa., steel	15.00-15.50
Pittsburgh, iron	12.50-13.00
Pittsburgh, steel	15.50-16.00
St. Louis, iron	9.50-10.00
St. Louis, steel	12.00-12.50

NO. 1 CAST SCRAP

Birmingham	9.00- 9.50
Boston, No. 2	6.00- 6.25
Boston, tex. con.	10.50-11.00
Buffalo, cupola	11.75-12.25
Buffalo, mach.	12.75-13.25
Chicago, agri. net	8.50- 9.00
Chicago, mach. net	9.00-10.00
Chi., railroad net	9.00- 9.50
Cinci., mach. cup	10.00-10.50
Cleveland, cupola	11.50-12.00
Detroit, net	10.50-11.00
Eastern Pa., cupola	12.00-13.00
Pittsburgh, cupola	13.00-13.50
San Francisco, del.	13.50-14.00
Seattle	7.00- 8.50
St. Louis, No. 1	9.00- 9.50
St. L., No. 1 mach.	9.00- 9.50

HEAVY CAST

Boston, del.	6.75- 7.00
Buffalo, break.	8.75- 9.25
Cleveland, break.	8.50- 9.00
Detroit, break	9.00- 9.50
Detroit, auto net	11.50-12.00
Eastern Pa.	11.50-12.00
N. Y., No. 1, deal	8.00- 8.50
N. Y., break. deal	7.25- 7.75
Pittsburgh	12.00-12.50

MALLEABLE

Boston, consum.	12.00-12.25
Buffalo	12.75-13.25
Chicago, R. R.	12.50-13.00
Cincin., agri. del.	8.75- 9.25
Cinci., R. R. del.	9.25- 9.75
Cleveland, rail.	11.50-12.00
Detroit, auto	9.75-10.25
St. Louis, R. R.	9.75-10.25
Eastern Pa., R. R.	11.50-12.50

RAILS FOR ROLLING

5 feet and over

Birmingham	11.00-11.50
Boston, dealers	7.75- 8.00
Buffalo	10.75-11.25
Chicago	12.50-13.00
Eastern Pa.	13.00
New York, dealer	7.50- 8.00
St. Louis	12.00-12.50

LOCOMOTIVE TIRES

Chicago (cut)	12.25-12.75
St. Louis, No. 1	9.00- 9.50

LOW PHOS. PUNCHINGS

Buffalo	12.50-13.00
Chicago	12.50-13.00
Eastern Pa.	15.50
Pittsburgh	15.50-16.00

Nonferrous Metal Prices of the Week

Spot unless otherwise specified. Cents per pound

	Copper: Electro., del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin: New York Spot	Straits Tin: New York Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 98-99%	Antimony Spot, N. Y.	Ingot Nickel
Feb. 24	8.00	8.12½	7.75	52.35	52.40	4.00	3.90	4.40	*22.90	7.20	36.00
Feb. 26	8.00	8.12½	7.75	52.20	52.25	4.00	3.90	4.40	*22.90	7.25	36.00
Feb. 27	8.00	8.12½	7.75	52.10	52.15	4.00	3.90	4.40	*22.90	7.25	36.00
Feb. 28	8.00	8.12½	7.75	52.00	52.05	4.00	3.90	4.40	*22.90	7.25	36.00
March 1	8.00	8.12½	7.75	52.30	52.37½	4.00	3.90	4.40	*22.90	7.25	36.00
March 2	8.00	8.12½	7.75	52.40	52.47½	4.00	3.90	4.40	*22.90	7.25	36.00

*Nominal quotation. Market range 19.00c to 22.90c.

Warehouse Iron and Steel Prices

Cents per pound for delivery within metropolitan districts of cities specified

STEEL BARS	
Baltimore*	2.75c
Boston††	2.90c
Buffalo	2.95c
Chattanooga	3.26c
Chicago	2.90c
Cincinnati	3.10c
Cleveland	2.90c
Detroit	2.98½c
Houston	3.00c
Los Angeles	3.40c
New Orleans	3.00c
New York‡(d)	3.17c
Pittsburgh	2.85c
Philadelphia*	2.75c
San Francisco	3.55c
Seattle	3.40c
St. Louis	3.14c
St. Paul	3.00c
Tulsa	3.25c

IRON BARS	
Portland	3.40c
San Francisco	3.55c
Baltimore*	2.60c
Chattanooga	3.26c
Chicago	2.75c
Cincinnati	3.10c
Detroit	2.98½c
New York‡(d)	3.10c
Philadelphia*	2.75c
St. Louis	3.14c
Tulsa	3.25c

REINFORC. BARS	
Boston	2.75c-3.25c
Buffalo	1.95c
Chattanooga	3.26c
Chicago	1.95c-2.10c
Cleveland (c)	1.97½c
Cincinnati	3.10c
Houston	3.25c
Los Ang., cl.	3.10c
New Orleans	3.00c
New York	3.17c
Philadelphia	2.62½c
Pitts., plain	3.00c
Pitts., twisted squares	3.12½c
Seattle	3.50c
St. Louis	3.29c
Tulsa	3.25c
Young.	2.30c-2.60c

SHAPES	
Baltimore*	2.75c
Boston††	3.07c
Buffalo	3.20c
Chattanooga	3.46c
Chicago	3.10c
Cincinnati	3.30c
Cleveland	3.21c
Detroit	3.30c
Houston	3.00c
Los Angeles	3.40c
New Orleans	3.50c
New York(d)	3.27c
Philadelphia*	2.75c
Pittsburgh	3.05c
Portland	3.40c
San Francisco	3.50c
Seattle	3.40c
St. Louis	3.34c
St. Paul	3.25c
Tulsa	3.50c

PLATES	
Baltimore*	2.75c
Boston††	3.08c
Buffalo	3.20c
Chattanooga	3.46c
Chicago	3.10c
Cincinnati	3.30c
Cleveland, ¼-in. and thicker	3.21c
Cleve., ⅜-in.	3.20c
Detroit	3.30c
Detroit, ⅜-in.	3.10c
Houston	3.00c
Los Angeles	3.40c
New Orleans	3.50c
New York(d)	3.30c
Philadelphia*	2.75c
Phila. floor	4.35c
Pittsburgh	3.05c
Portland	3.40c
San Francisco	3.50c
Seattle	3.40c
St. Louis	3.34c
St. Paul	3.25c
Tulsa	3.50c

NO. 10 BLUE	
Baltimore*	2.95c
Boston††	3.15c
Buffalo	3.10c
Chattanooga	3.26c
Chicago	2.95c
Cincinnati	3.10c
Cleveland	3.01c
Det., 8-10 ga.	3.03½c
Houston	3.35c
Los Angeles	3.65c
New Orleans	3.50c
New York	3.17c
Portland	3.65c
Philadelphia*	2.95c
Pittsburgh	2.85c
San Francisco	3.75c
Seattle	3.65c
St. Louis	3.19c-3.36c
St. Paul	3.45c
Tulsa	3.70c

NO. 24 BLACK	
Baltimore*†	3.50c
Boston (g)	3.75c
Buffalo	3.25c
Chattanooga	4.01c
Chicago	3.70c
Cincinnati	3.85c
Cleveland	3.76c
Detroit	3.78½c
Los Angeles	4.15c
New York	3.65c
Philadelphia*†	3.40c
Pittsburgh**	3.40c
Portland	4.25c
San Francisco	4.25c
Seattle	4.25c
St. Louis	3.94c
St. Paul	3.695c
Tulsa	4.75c

NO. 24 GAL. SHEETS	
Baltimore*†	3.75c
Buffalo	4.00c
Boston (g)	4.35c
Chattanooga	4.61c
Chicago	4.20c-4.30c
Cincinnati	4.45c
Cleveland	4.36c
Detroit	4.45c
Houston	4.40c
Los Angeles	4.75c
New Orleans	4.35c
New York	4.25c
Pitts.**	3.90c-4.20c
Portland	4.85c
San Francisco	4.85c
Seattle	4.85c
St. Louis	4.54c
St. Paul	4.19c
Tulsa	5.10c
Philadelphia*†	4.00c

BANDS	
Baltimore	3.05c
Boston††	3.15c
Buffalo	3.30c
Chattanooga	3.51c
Chicago	3.20c
Cincinnati	3.35c
Cleveland	3.26c
Detroit, ⅜-in. and lighter	3.28½c
Houston	3.25c
Los Angeles	3.80c
New Orleans	3.20c
New York(d)	3.42c
Philadelphia	3.05c
Pittsburgh	3.10c
Portland	3.90c
San Francisco	3.15c
Seattle	3.90c
St. Paul	3.20c
Tulsa	3.45c
St. Louis	3.44c

HOOPS	
Baltimore	2.80c
Boston	4.15c
Buffalo	3.55c
Chicago	3.20c
Cincinnati	3.35c
Det., No. 14 and lighter	3.28½c
New York	3.42c
Philadelphia	3.30c
Pittsburgh	3.60c
Seattle	5.40c
St. Paul	3.75c

COLD FIN. STEEL	
Baltimore (c)	3.71c
Boston	4.00c-4.50c
Buffalo (h)	3.55c
Chattanooga*	4.06c
Chicago (h)	3.50c
Cincinnati	3.70c
Cleveland (h)	3.50c
Detroit	3.63½c
Los Ang. (f)	5.95c
New Orleans	4.25c
New York	3.92c-4.42c
Philadelphia	3.73c
Pittsburgh(h)	3.45c
Portland (f)	4.75c
San Fran. (f)	5.95c
Seattle (f)	4.75c
St. Paul	3.20c
St. Louis	3.74c
Tulsa	4.65c

COLD ROLL. STRIP	
Boston, 0.100-in., 500 lb. lots	5.20c
Buffalo	5.25c
Chicago (b)	5.65c
Cincinnati	5.80c
Cleveland (b)	5.55c
Detroit	5.40c
Philadelphia	4.00c
New York	4.55c
St. Louis	5.74c

(b) Net base, straightening, cutting, boxing, 1 ton or more.
(c) Plus mill, size and quantity extras.
(d) Minus quant. diff.
(e) New mill classif.
(f) Rounds only.
(g) 50 bundles or over.
(h) Outside delivery, 10c less.

‡Domestic bars.
*Plus quan. extras.
**Under 25 bundles.
*†50 or more bundles.
†New extras apply.
††Base 40,000 lbs. extras on less.

Prices at Detroit, Cleveland, Chicago, Pittsburgh, Cincinnati, Chattanooga, New York, Boston, St. Louis on heavier lines are subject to new quantity differentials:

399 pounds and less, up 50 cents; 400 to 9999 pounds, base; 10,000 to 19,999 pounds, 15 cents under; 20,000 to 39,999 pounds, 25 cents under; 40,000 pounds and over, 35 cents under base.

Current Iron and Steel Prices of Europe

Dollars at Rates of Exchange, Mar. 1

Export Prices f. o. b. Ship at Port of Dispatch—By Cable (or Radio)

	British gross tons U. K. ports £ s d	Continental Channel or North Sea ports, metric tons Gold parity, $4.8665 £ s d
PIG IRON		
Foundry, 2.50-3.00 Silicon.	$14.86 2 18 6	$8.52 1 15 0
Basic bessemer	13.72 2 14 0*	7.30 1 10 0
Hematite, Phos. .03-.05	16.64 3 5 6	....
SEMIFINISHED STEEL		
Billets	$27.94 5 10 0	$11.44 2 7 0
Wire rods, No. 5 gage	39.62 7 16 0	21.90 4 10 0
FINISHED STEEL		
Standard rails	$39.37 7 15 0	$26.77 5 10 0
Merchant bars	1.65c 7 5 0	.72c 3 5 0
Structural shapes	1.67c 7 7 6	.63c 2 17 6
Plates, †¼ in. or 5 mm.	1.82c 8 0 0	.91c 4 2 6
Sheets, black, 24 gage or 0.5 mm.	2.10c 9 5 0	1.27c 5 15 0
Sheets, gal., 24 gage, corr.	2.55c 11 5 0	1.43c 6 10 0
Bands and strips	1.82c 8 0 0	.88c 4 0 0
Plain wire, base	2.21c 9 15 0	1.18c 5 7 6
Galvanized wire, base	2.61c 11 10 0	1.38c to 1.40c 6 5 6 to 6 7 6
Wire nails, base	2.72c 12 0 0	1.27c 5 15 0
Tin plate, box 108 lbs.	$ 4.19 0 16 6	....

British ferromanganese $85 delivered Atlantic seaboard, duty-paid. German ferromanganese £9 0s 0d 4($3.74) f.o.b.

Domestic Prices at Works or Furnace—Last Reported

	£ s d		French Francs		Belgian Francs		Reich Marks
Fdy. pig iron, Si. 2.5	$17.15	3 7 6(a)	$13.16	200	$14.21	305	$24.95 63
Basic bessemer pig iron	16.51	3 5 0(a)*	12.17	185	13.51	290	27.53 (b)69.50
Furnace coke	4.57	0 18 0	7.90	120	5.13	110	7.62 19.25
Billets	27.94	5 10 0	26.65	405	20.50	440	38.22 96.50
Standard rails	1.87c	8 5 0	2.10c	700	2.31c	1,100	2.38c 132
Merchant bars	1.95c	8 12 0	1.68c	560	1.16c	550	1.98c 110
Structural shapes	1.99c	8 15 0	1.65c	550	1.16c	550	1.94c 107.50
Plates, †¼-in. or 5 mm.	1.93c	8 10 0	2.10c	700	1.47c	700	2.29c 127
Sheets, black	2.33c	10 5 0§	2.55c	850‡	1.63c	775‡	2.59c 144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	2.89c	12 15 0	4.35c	1,450	3.15c	1,500	6.66c 370
Plain wire	2.21c	9 15 0	3.39c	1,130	2.31c	1,100	3.11c 173
Bands and strips	2.38c	10 10 0	1.95c	650	1.47c	700	2.29c 127

*Basic. †British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open-hearth steel. Continental usually for basic-bessemer steel. (a) del. Middlesbrough. (b) hematite

Bars

Bar Prices, Page 50

Pittsburgh—Automotive buying of bars, which has been noteworthy the past month to six weeks, has increased, indicating desire of automobile manufacturer to lay in stocks against possible labor troubles or inability of mills to make early deliveries. Carbon steel bars hold firmly at 1.75c, Pittsburgh, and will continue on that basis for second quarter. The market on alloy bars remains 2.45c, Pittsburgh.

Cleveland—February bar releases for some leading interests here were double the January tonnage, and basing estimates on contract requirements for the remainder of the quarter, they are confident March will show further substantial gains. Specifications from the automotive industry have slowed up since prices have been reaffirmed for second quarter. This reduced the week's volume, despite a broadening in miscellaneous demand. Buyers have not yet begun to contract for second quarter.

Boston—Soft steel bar buying is light at 2.15c, delivered, Boston. Machinery builders are taking small shipments. Alloy steel bars are more active, but all types of bars, are dull, although the outlook for railroad demand is fairly good.

Chicago—Soft steel bar shipments are well maintained, with some additional gains in requirements of the automotive and farm implement industries. Steel bar producers are faced with heavy automotive shipments for several weeks. Current prices of 1.80c, Chicago, for soft steel bars, 1.70c for rail steel and 1.60c, Terre Haute, Ind., for bar iron are being continued.

New York—Sellers of steel bars are waiting for railroad buying to lift the market from its present dullness.

Philadelphia — Miscellaneous demand for steel bars fail to meet expectations of most sellers, and with prices unchanged for second quarter at 1.75c, Pittsburgh, or 2.04c, Philadelphia, no immediate improvement is expected.

Ferroalloys

Ferroalloy Prices, Page 52

Sellers of ferromanganese are expected to open books for third quarter about March 15 at unchanged prices. However, no seller has indicated officially what he will do, pending further appraisal of costs for that period. Specifications are lagging. Current price is $85, duty paid, eastern seaboard. Domestic spiegeleisen, 19 to 21 per cent, is unchanged at $26, furnace, for spot carload shipments.

Plates

Plate Prices, Page 50

Pittsburgh — McClintic-Marshall Corp., Bethlehem, Pa., bid low on 1000 feet of fabricated steel pipe and 20 small pontoons for United States engineers at Kansas City, Mo., when bids were opened Feb. 23, this job taking about 2500 tons of plates. Babcock & Wilcox, Beaver Falls, Pa., was second low. Marietta Mfg. Co., Pt. Pleasant, W. Va., is low on two large dredges for the same engineers. McClintic-Marshall Corp. also was low on a 150-ton barge for Vicksburg, Miss., March 1.

With demand for large tanks and heavy plate for pipe work definitely slower and delays still featuring the market for railroad plates, activity is restricted.

Pittsburgh base of 1.70c applies for the remainder of this quarter, and by inference through early second quarter at least.

Cleveland—The market in general is quieter, material for freight cars recently awarded by railroads here not yet having reached mills in volume. Some sellers booked more carload orders during the week from miscellaneous users. Plates have been reaffirmed for second quarter at 1.70c, base, Pittsburgh.

Chicago — Plate releases by railroads and freight car builders are deferred and with activities of tank and structural fabricators light, plates are moving slowly. Mills expect to start shipments of material for railroad building in about 30 days.

Boston — Demand for plates has fallen slightly, although a fair volume is up for figures. Plates are steady at 1.80c, Coatesville, Pa.

New York—Plate sellers look for an early expansion of railroad requirements with new car and locomotive inquiry. Delaware, Lackawanna & Western is augmenting its pending equipment tonnage. General inquiry is slack.

Contracts Placed

900 tons, siphons for Owyhee project, Oregon, to Chicago Bridge & Iron Works, Chicago; Morrison-Knudsen Co., Boise, Idaho, general contractor.

505 tons, 1,500,000-gallon elevated water tank, Spartansburg, S. C., to R. D. Cole Mfg. Co., Newnan, Ga.

325 tons, two mooring barges, United States engineer, Vicksburg, Miss., to Jones & Laughlin Steel Corp., Pittsburgh.

150 tons, snag boat for United States engineer, Vicksburg, Miss., to Nashville Bridge Co., Nashville, Tenn.; $256,200.

115 tons, 250,000-gallon elevated tank, Crownsville, Md., to Pittsburgh-Des Moines Steel Co., Pittsburgh.

Unstated tonnage, several floating tanks for Atlantic Refining Co., Philadelphia, to Chicago Bridge & Iron Works, Chicago.

Unstated tonnage, 180 welded plate special third class buoys, lighthouse bureau, Staten Island, N. Y., to United Welding Co., Middletown, O.

Unstated tonnage, 150,000-gallon elevated tank, Aberdeen proving grounds, Aberdeen, Md., to Pittsburgh-Des Moines Steel Co., Pittsburgh, at $1290.

Contracts Pending

1400 tons, including 210 tons of floor plates, bureau of supplies and accounts, navy department, Washington, delivery, east and west yards; bids Feb. 20.

500 tons, 20 pontoons and 1000 feet of steel pipe for United States engineers, Kansas City, Mo.; McClintic-Marshall Corp., Bethlehem, Pa., low.

208 tons, 16-inch welded steel pipe, East bay municipal utility district, Oakland, Calif.

200 tons, estimated, boiler and heating plant, bureau of yards and docks, Annapolis, Md.; bids asked.

200 tons, 500,000-gallon standpipe, Smithfield, R. I.; plans being prepared.

150 tons, 120 x 60 x 7 foot steel barge for Vicksburg, Miss., engineers; McClintic-Marshall Corp., Bethlehem, Pa., low; Midland Barge Co., Midland, Pa., second low; bids March 1.

110 tons, 80-foot lighthouse tender, diesel powered; bids by Lighthouse department, Portland, Oreg., March 8.

Unstated tonnage, 150 fifty-five-gallon steel alcohol drums, CRS3 corrosion resistant steel, navy department, Washington; bids March 13.

Unstated tonnage, 1640 pieces of 28-inch welded or riveted pipe; 820 pieces of ½-inch wall and 820 pieces of ¾-inch wall for Ft. Peck dam, Montana; bids to United States engineers, Kansas City, Mo., March 26.

Unstated tonnage, two super stern-wheel 34-inch suction dredges for United States engineers, Kansas City, Mo.; Marietta Mfg. Co., Pt. Pleasant, W. Va., low; bids Feb. 17.

Unstated tonnage, barge B-45, Fort Monroe, Va., Chicago Bridge & Iron Works, low; bids Feb. 1.

Sheets

Sheet Prices, Page 50

Pittsburgh—Although demand for sheets broadened slightly last week, enough to support a 45 per cent rate of operations in Pittsburgh sheet mills, severe weather affected shipments to rural districts. Special activity is noted in orders from sheet users who manufacture small tanks and stoves. Electrical sheets are in good demand from producers of small

motors. The $2 a ton reduction in hot-rolled, pickled in break-down, annealed deoxidized sheets, has been rescinded and the market continues at the first quarter level. Pittsburgh base prices are being extended into the second quarter as follows: 2.25c on black; 2.85c on galvanized; and 2.75c on No. 20 gage cold-rolled.

Cleveland—While sheet mill operations in this district have not yet relaxed, the delivery situation has eased. Specifications coming from the automobile industry during the week were lighter. Some mills which withdrew from the market for cold rolled sheets two weeks now find they can take additional orders for rolling this month. Second quarter books were opened March 1, with prices reaffirmed, but few contracts have been entered.

Chicago—Sheet demand is fairly steady with shipments of cold-rolled material near capacity as a result of heavy requirements of the automotive industry spotty. Prices are being extended into second quarter.

Boston—Sheet buying has slowed up, small tank fabricators, container makers, stamping shops, and miscellaneous demand being easier. Opening of books for the second quarter at unchanged prices on most finishes consumed here caused many buyers to continue a cautious policy.

Philadelphia — Sheet sellers generally are opening books for second quarter at unchanged prices. Apart from the probable placing of substantial tonnage by autobody manufacturers, relatively little sheet buying is in prospect in this district.

Buffalo—Sheetmakers here continue to operate at 75 to 80 per cent. Consumers report difficulty in getting prompt deliveries of several grades.

New York—Although prices on the common grades of sheets have been reaffirmed for second quarter, buying has been stimulated to some extent through fear of possible labor difficulties later in the season. Bureau of supplies and accounts, navy department, Washington, closed bids Feb. 23 on approximately 650 tons of sheets, delivery to east and west coast navy yards.

Effective March 11, 1.40c, Pittsburgh, and 1.50c, Gary, Ind., will apply on certain of the heavier gages of galvanized sheets rejects of known sizes, and on wasters of random sizes. This is a reduction of $12 a ton on rejects, and $7 on wasters. The new prices have been filed with the Iron and Steel institute.

St. Louis—Improvement noted recently in demand for sheets has been well maintained, and in a number of grades, carried further. Automotive releases continued in satisfactory volume. Galvanized material has picked up notably as compared with a month ago.

Cincinnati—Demand is strong and diversified. Prices have been reaffirmed for second quarter, some orders are being taken as soon as books were opened. Production schedules remain near 70 per cent.

Railroads

Track Material Prices, Page 51

Rail purchases are heavier, 39,000 tons placed last week by three roads; Chicago & North Western 25,000 tons, Southern 10,000 tons and Chicago & Eastern Illinois, 4000 tons.

Prospective buying includes 42,121 tons by the Erie, which is expected to be closed within a fortnight, and 40,000 tons by the New York Central, bids on which were postponed last week. Wisconsin Central's receiver has asked permission of the interstate commerce commission to buy 1574 tons.

Rail mills have good backlogs but specifications are slow and not many rails are being produced. Carnegie's rail mill at Homestead, Pa., is not able to schedule a rolling. Chicago mills are operating at a moderate rate with sufficient orders for about two months. Birmingham mills are fairly active on an accumulation of specifications. About 500 tons of light rails has been booked for export.

The carbuilders' code has been approved, and more action is now anticipated on award of materials for cars recently placed.

Railroad tonnage continues by far the largest single factor in iron and steel activity in the East, with the Pennsylvania releases leading. First releases against the Pennsylvania rail contracts awarded last fall are expected this week. The Reading Co., which bought virtually nothing in February, is expected to bring out this month a round tonnage for repairing 8000 freight cars.

The Reading also is planning to repair cars for its affiliate, the Central Railroad of New Jersey, and is figuring on repairs to freight cars and locomotives for another affiliate, the Baltimore & Ohio. The latter has a program for repairing 5000 freight cars and 240 locomotives and, in addition, is expected to buy more than 800 freight cars.

Buying of the past week includes 3500 tons of cast steel underframes for 500 flat cars for the Pennsylvania, the order going to the Commonwealth division of the General Steel Castings Co., at Granite City, Ill. Underframes for 1000 flat cars remain to be placed. Whether these will be of cast steel or rolled steel has not been decided, it is said.

Delaware, Lackawanna & Western is inquiring for 25 locomotives, 500 hoppers of 50-ton capacity, 500 of 70-ton capacity. It is believed, however, that only 500 hoppers will be bought. Central of Georgia is reported to be inquiring again for 200 hoppers of 70-ton capacity. Boston & Maine is inquiring for 20 de luxe coaches.

Pittsburgh & West Virginia has purchased three heavy freight locomotives from Baldwin Locomotive Works, Philadelphia. PWA granted a loan of $331,000.

Gulf, Mobile & Northern has been given a loan of $1,000,000 PWA loan for 200 freight cars, and $500,000 for passenger equipment.

Letting of 42,121 tons of rails by the Erie will be accompanied by placing of 12,340 tons of fastenings.

Locomotives Placed

Pittsburgh & West Virginia Railway Co., three heavy freight locomotives to Baldwin Locomotive Works, Eddystone, Pa.; P.W.A. loan of $331,000 granted; work to begin immediately.

Rail Orders Placed

Chicago & North Western, 25,000 tons, to Illinois Steel Co. and Inland Steel Co., Chicago; 4000 tons tie plates, 1460 tons splice bars, 910 tons track bolts and spikes, to several suppliers.

Chicago & Eastern Illinois; 3200 tons to Illinois Steel Co., Chicago, 800 tons to Inland Steel Co., Chicago; 1000 tons of tie plates, 800 tons of miscellaneous fastenings to several producers.

Southern, 10,000 tons, divided 3000 tons 130-pounds and 7000 tons 100-pound, to Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

Car Orders Pending

Alaska Railroad, department of interior, Seattle, 10 air dump cars, 25 yards capacity; bids March 2.

Boston & Maine, 20 de luxe coaches; bids asked.

Central of Georgia, 200 steel hoppers; bids asked.

Delaware, Lackawanna & Western, 500 hoppers, 50-ton, 500 of 70-ton capacity; bids asked.

Locomotives Pending

Bureau of Supplies and Accounts, navy department, Washington, two 55-ton capacity, locomotives, Mare Island, Calif.; bids March 13.

Delaware, Lackawanna & Western, 25 Locomotives; bids asked.

Rail Orders Pending

Erie, 29,987 tons No. 1 rail, 12,134 tons No. 2, and 12,340 tons fastenings, PWA loan approved.

Wisconsin Central, 1574 tons, and 776 tons fastenings; PWA loan applied for.

Warehouse

Warehouse Prices, Page 54

Pittsburgh—February demand for steel warehouse products was about equal to that of January, in spite of the shorter month. There has been no change in prices.

Cleveland — Warehouse business here increased during the last ten days of February, and for leading sellers the volume, in dollars, was slightly larger than in January. Bars and plates have been in better demand. Prices are unchanged.

Chicago—Holidays and the shorter month combined to curtail February sales although the month's business was well above the rate a year ago. Prices are unchanged, with revisions in alloy steel bars in prospect.

Boston—Blue annealed sheets have been advanced 25 cents per 100 pounds by Boston warehouses. February volume decreased from January partly due to severe weather conditions.

New York—Warehouse volume has declined with most jobbers, largely due to weather conditions. Prices are unchanged and steady.

Detroit—Iron and steel warehouse business continues to show slight improvement, February sales having developed an encouraging increase over January. Prices are unchanged.

Cincinnati— Buying from warehouse is diversified, though building demand is slow, and February was close to January tonnage. Prices are unchanged.

St. Louis—Daily average of warehouse business in February was slightly greater than in January. As contrasted with last year, the volume in February showed a gain of approximately 40 per cent.

Bolts, Nuts, Rivets

Bold, Nut, Rivet Prices, Page 51

Bolt, nut and rivet producers probably will announce second quarter prices this week or next. As there has been no change in wire rods or bars, bolts and nuts likely will continue at 70 off list and large rivets unchanged at 2.75c base, Pittsburgh or Cleveland, and 2.85c, Chicago. Small rivets continue 70 and 10 off list.

Further improvement in specifications is noted at Cleveland. While automotive requirements still lead, railroad demand is showing a more rapid expansion.

An interesting recent award involves 32,000 pounds of monel rivets for destroyers for the navy. The order, said to be the largest of its kind ever reported, went to the Townsend Co., New Brighton, Pa., although the Reed & Prince Mfg. Co., Worcester, Mass., was orginally low. The business is said to have gone at fractionally higher than 43 cents a pound. Bids will be opened March 7 by the Frankford arsenal, Frankford, Pa., on 33,300 steel nuts, hexagon head.

Cold Finished

Cold Finished Prices, Page 51

Pittsburgh—The market on cold-finished steel bars holds at 2.10c base, Pittsburgh, with other basing points firm. February showed a 50 to 60 per cent increase in specifications over January and proportionately heavier shipments. The automotive trade still is the most prominent buyer of cold-finished steel.

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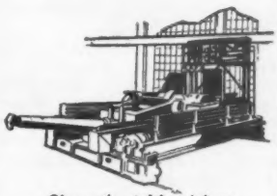

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Shapes

Structural Shape Prices, Page 50

New York—Award of 12,300 tons for the Manhattan midtown postoffice, New York, removes the largest structural project from the pending list in this territory. Including shafts for the midtown Hudson tunnel, state highway projects and other public work, pending requirements are not much more than 10,000 tons. Fabricating shops are taking in a minimum of material at 1.80c, Bethlehem, Pa.

Philadelphia—Apart from prospective awards for the Camden, N. J., approach to the high speed line over the Delaware river bridge, little is pending in the local structural market. Shapes have been reaffirmed for second quarter at 1.80c, Bethlehem, Pa.; or 1.90½c, delivered Philadelphia.

Pittsburgh—Contractors have been named on the Pennsylvania state letting of Feb. 23. On March 9 bids will be closed on an 815-ton truss bridge in Perry county. The 1.70c base on plain structural shapes is firm, but fabricated and erected structural prices are irregular.

Cleveland—For Woodward avenue grade separation work in Detroit, 850 tons have been awarded American Bridge Co., Pittsburgh. Government engineers here have not yet closed on substantial tonnages of steel piling for Lake Erie breakwaters, and public work generally is light. Some sellers are experiencing a better demand for small lots of plain material.

Chicago—Structural inquiries and awards the past week were considerably below the recent average, with small lots predominating. Bids will be taken this week on a bridge at Omaha requiring 4500 tons. Orders include 321 tons for a Sears, Roebuck & Co. store here.

Boston—A Waterbury, Conn., contractor is low on the Holyoke, Mass., postoffice, and an addition to the Beverly, Mass., postoffice is being figured. Bids go in this week on a 5000-ton bridge superstructure, Fore river, Quincy, Mass., with more structural work coming forward.

Contracts Placed

12,300 tons, superstructure, Manhattan, New York, midtown postoffice, to McClintic-Marshall Corp., Bethlehem, Pa.; James Stewart & Co. Inc., New York, general contractor. Reinforcing material steel pending.

1450 tons, piling, lock No. 12, Bellevue, Iowa, to unstated interest.

1170 tons, Pennsylvania state highway bridge, North Whitehall and Lehigh townships, Lehigh and Northampton counties, Pennsylvania, to McClintic-Marshall Corp., Bethlehem, Pa.; through Charles Riebel, Lansford, Pa.

1050 tons, floodway bridge, Bonne Carre, La., for Illinois Central railroad, to Virginia Bridge & Iron Co., Roanoke, Va.

870 tons, government buildings at Fort Lewis, Wash.; 335 tons, army barracks, to Young Iron Works, Portland, Oreg.; 250 tons, gun sheds, to Pacific Coast Steel Corp., Seattle; 160 tons, stables, to Isaacson Iron Works, Seattle; and 125 tons, ordnance repair shop, to Wallace Bridge & Structural Steel Co., Seattle.

850 tons, approach spans, Elizabeth river bridge, Norfolk, Va., to Virginia Bridge & Iron Co., Roanoke, Va.

850 tons, Woodward avenue grade separation, Detroit, to American Bridge Co., Pittsburgh.

640 tons, Pennsylvania state bridge, route 250, to Phoenix Bridge Co., Phoenixville, Pa.

490 tons, bridge NRH 5-8B, Shelby county, Tennessee, to Virginia Bridge & Iron Co., Roanoke, Va.

370 tons, state bridge, Deer Creek and Chestertown, Maryland, to Fort Pitt Bridge Works, Pittsburgh.

321 tons, Chicago retail store, Sears, Roebuck & Co., to Joseph T. Ryerson & Sons Inc., Chicago.

300 tons, shapes and bars, police station and jail, Atlanta, Ga.; shapes to Ingalls Iron Works Co., Birmingham, Ala., bars to Kalman Steel Corp., Bethlehem, Pa.; Pittman Construction Co., Atlanta, Ga., general contractor.

295 tons, bridge, Octoraro creek, Maryland, to Fort Pitt Bridge Works; Thomas, Bennett & Hunter, Westminster, Md., general contractors.

270 tons, part of steel for Fifth Regiment Armory, Maryland, to Dietrich Bros., Baltimore.

270 tons, government laboratory building, Ocean Port, N. J., to Belmont Iron Works, Philadelphia.

240 tons, bridge and underpass, Boyle and Fayette counties, Kentucky, to McClintic-Marshall Corp., Bethlehem, Pa.; Ralph E. Mills Co. Inc., Frankfort, Ky., general contractor.

230 tons, six beam and one truss span, Sioux county, Iowa, to American Bridge Co., Pittsburgh.

230 tons, hangar, Aberdeen proving grounds, Maryland, to McClintic-Marshall Corp., Bethlehem, Pa.; Minter Homes Corp., Huntington, W. Va., general contractor.

220 tons, bridges near Williamsburg, Va., to Dietrich Bros., Baltimore.

215 tons, multiple beam spans, project 348-C, Nebraska, to Omaha Steel Works, Omaha, Nebr.

210 tons, six beam spans, Douglas county Nebraska, to Omaha Steel Works, Omaha, Nebr.

200 tons, automobile storehouse, Philadelphia, to Bethlehem Fabricators Inc., Bethlehem, Pa.

175 tons, coal cleaning plant, Coal Creek, Tenn., Tennessee Valley Authority, to Ingalls Iron Works Co., Birmingham, Ala.

168 tons, three bridges, Craig county, Oklahoma, also 49 tons of reinforcing bars, to unstated fabricators; Nims & Frost, Hydro, Okla., general contractors.

132 tons, bridge and approaches, Falling River, Campbell county, Virginia to Virginia Bridge & Iron Co., Roanoke, Va.; Boston Construction Co., South Boston, Va., general contractor. Joseph T. Ryerson & Sons Inc., Jersey City, awarded 34 tons of reinforcing bars.

120 tons, state highway bridge, Clearfield county, Pennsylvania, to Lackawanna Steel Construction Corp., Buffalo.

105 tons, buildings, Sinclair Refining Co., Wellsville, N. Y., to Lackawanna Steel Construction Corp., Buffalo.

100 tons, shapes and bars, railroad underpass, Colorado county, Texas, to Austin Bros., Dallas, Tex.; Austin Bridge Co., Dallas, Tex., general contractor.

Shape Awards Compared

	Tons
Week ended March 3	**23,721**
Week ended Feb. 24	**13,391**
Week ended Feb. 17	**34,751**
This week in 1933	**9,805**
Weekly average for 1933	**15,413**
Weekly average 1934	**19,151**
Weekly average February	**19,676**
Total to date 1933	**91,662**
Total to date 1934	**172,359**

Contracts Pending

2350 tons, Camden, N. J., approach to high-speed line over the Delaware river bridge, section 2, Philadelphia; specifications out this week; also specifications on 1700 tons of sheet piling and 1100 tons of reinforcing bars. Specifications on section 3 of this approach will be out in May or June and will include 1400 tons of shapes, 1000 tons of piling and 700 tons of reinforcing bars.

1000 tons, steel piling, Cape May, N. J.; bids March 13.

940 tons, New Jersey state bridge, route 23; bids March 5.

720 tons, bridge, Logan, W. Va.

650 tons, postoffice, Binghamton, N. Y.; bids postponed from Feb. 26 to March 6.

460 tons, through truss bridge, West Manchester township, York county, Pennsylvania; G. A. & F. M. Wagman, Dallastown, Pa., low on general contract at $85,978; included 24 tons of plain steel bars; opening of Feb. 23.

400 tons, state bridge, Riverside, N. J.; bids asked.

400 tons, Woodrow Wilson high school, Washington.

350 tons, county courthouse, Schenectady, N. Y.

275 tons, park improvements, Traverse City, Mich.

275 tons, postoffice, Holyoke, Mass.; Tremaglio Bros., Waterbury, Conn., low on general contract.

230 tons, including shapes, reinforcing bars, piling and miscellaneous castings, gates and alterations to lock and dam in the Cape Fear river, North Carolina; bids March 2 to army engineers, Wilmington, N. C.

230 tons, bridges, Texas; bids March 5.

200 tons, bureau of supplies and accounts, navy department, Washington; bids in Feb. 27; material includes angles, channels and I-beams.

200 tons, two Minnesota highway bridges.

200 tons, naval reserve armory, Toledo,

O.; bids in Feb. 28.
200 tons, piling, bridge pier repairs, Prairie du Sac, Wis.
200 tons, highway structures, Mississippi; bids March 6.
175 tons, sewage disposal plant, Milwaukee.
170 tons, through truss bridge, Meshoppenboro, Wyoming county, Pennsylvania; Joseph Banks Construction Co., Wilkes Barre, Pa., low at $38,676; included 37 tons of plain steel bars.
150 tons, county highway bridge, Wheatland, Pa.
125 tons, factory extension, Hall China Co., E. Liverpool, O.
122 tons, and 30 tons of concrete bars, state bridge, Marion county, Ohio; original bids rejected and readvertised for March 9.
100 tons, hangar, coast guard, Winter Island, Salem, Mass.; Marden Construction Co., Boston, low.
100 tons, trusses for United States forest service, San Francisco; Golden Gate Iron Works, San Francisco, low.

Reinforcing

Reinforcing Bar Prices, Page 51

Pittsburgh — Pennsylvania state highway lettings are active. A western mill is low on the 3000-ton Boulder dam specification of Feb. 23. The market continues 1.90c, Pittsburgh, for new billet steel to be used in reinforcing work.

Department of supplies of the city of Pittsburgh is asking for bids until March 7 on steel reinforcing bars for the department of public works for the period ending June 30, 1934.

Boston—Additional reinforcing requirements for bridges and highways in several New England states are about to come out. Meanwhile lettings are light. Prices are firm at 1.90c, Pittsburgh, for cut lengths in car lots.

Cleveland—Purchase of 2500 tons of reinforcing steel for Cleveland's southerly sewage disposal plant will be made shortly, after long delay, since adjacent villages have given permits for work necessary in their limits. The general contract has been placed, and the material was expected to be supplied by the Cleveland bar mill. Public work in general is developing slowly, projects on which the state recently took bids still hanging fire.

Chicago—While a moderate gain is noted in inquiries for private projects, these generally involve lots of less than 100 tons, and public construction comprises the bulk of orders and inquiries. Illinois has taken bids on 900 tons additional for road work, 500 tons of which is in Cook county. An early award of 725 tons for a Cook county bridge is anticipated. For the river lock at Bellevue, Iowa, 550 tons have been placed with the Inland Steel Co. Reinforcing bar prices continue 1.95c for billet steel, and 1.80c for rail steel.

New York—Reinforcing bar contracts placed during the week total

Concrete Awards Compared

	Tons
Week ended March 3	4,524
*Week ended Feb. 24	4,615
Week ended Feb. 17	5,206
This week in 1933	4,475
Weekly average for 1933	3,771
Weekly average 1934	4,300
Weekly average, February	3,683
Total to date 1933	36,054
Total to date 1934	38,705

*Revised.

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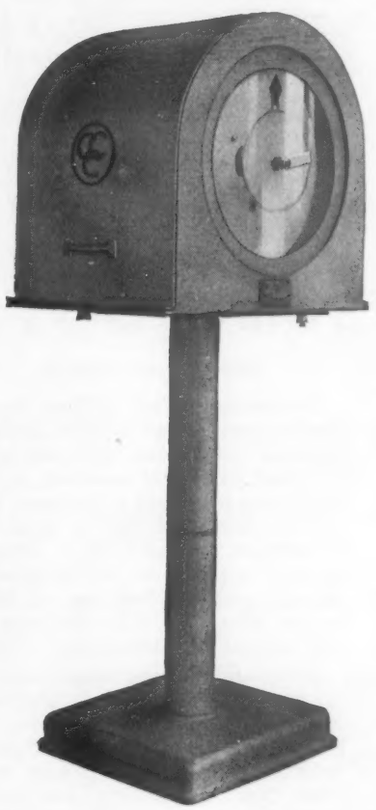

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close to 1000 tons, fully half for highways and bridges. Several thousand tons still are active in New York, New Jersey and nearby territory.

Contracts Placed

920 tons, sewer, Washington, to Concrete Steel Co., New York.

729 tons, Calvert street bridge, Rock creek, Washington, to Hudson Supply & Equipment Co., Washington.

550 tons, lock No. 12, Bellevue, Iowa, to Inland Steel Co., Chicago.

500 tons, Military Academy, West Point, N. Y., divided between Concrete Steel Co., New York, and Kalman Steel Corp., Bethlehem, Pa.

370 tons, state highway projects, Nassau and Queens counties, New York, to Capitol Steel Co., Brooklyn; W. W. Construction Co. Inc., New York, general contractor.

350 tons, distillery, Lawrenceburg, Ind., to Pollak Steel Co., Cincinnati; through J. & E. Warm Co., general contractor, Cincinnati.

350 tons, floor mesh, Manhattan midtown postoffice, New York, to American Steel & Wire Co., New York; through James Stewart & Co. Inc., New York, general contractor.

315 tons, underpass Boyle county, Kentucky, to Dudley Bar Co., Chattanooga, Tenn.; Ralph E. Mills Co. Inc., Frankfort, Ky., general contractor.

225 tons, state highway, Essex county, New York, to Kalman Steel Corp., Bethlehem, Pa.; through Warren Bros. Roads Co., Cambridge, Mass., general contractor.

200 tons, building for Hershey Chocolate Co., Hershey, Pa., to Wrought Iron Co. of America, Lebanon, Pa.

180 tons, courthouse and jail, Enid, Okla., to J. B. Klein Iron & Foundry Co., Oklahoma City; Reinhart & Donovan Co., Oklahoma City, general contractor.

105 tons, Upatoi creek bridge, quartermaster, Fort Benning, Ga., to Kalman Steel Corp., Bethlehem, Pa.; Hardaway Contracting Co., Columbus, O., general contractor.

100 tons, prison building, Auburn, N. Y., to Capitol Steel Co., Brooklyn, N. Y.

100 tons, grade separation, Interboro Parkway, Queens county, New York, to Igoe Bros., Newark, N. J.; Arthur A. Johnson Corp., general contractor.

100 tons, Red river bridge extension, Avoyelles parish, Louisiana, to Truscon Steel Co., Youngstown, O.; Stevens Bros., St. Paul, Minn., general contractor.

100 tons, Elm creek bridge, Maverick county, Texas, to Alamo Iron Works, San Antonio, Tex; Bart Moore Co., San Antonio, general contractor.

100 tons, army officers' quarters, Fort Lewis, Wash., to Pioneer Sand & Gravel Co., Seattle.

100 tons, state highway, Nassau county, New York, to Kalman Steel Corp., Bethlehem, Pa.; through Carlton Co. Inc., New York.

Contracts Pending

3000 tons, Boulder dam project, bids of Feb. 23; Sheffield Steel Corp., Kansas City, Mo., low.

1900 tons, sewage line, leading to Anacosta river, District of Columbia sewage commission, Washington; bids asked.

1100 tons, section 2, Camden approach, high-speed line over the Delaware river bridge, Philadelphia; specifications expected out this week; 700 tons, section 3, same approach, specifications out in May or June.

900 tons, road work, Illinois.

640 tons, highway projects, Texas; bids March 5.

850 tons, midtown Hudson river tunnel, Manhattan, N. Y.—Weehawken, N. J.

525 tons, bars and mesh, midtown Manhattan, New York, postoffice.

245 tons, two state bridges, Santa Barbara county, California; bids opened.

218 tons, two reinforced concrete structures and paving, Hanover township, Luzerne county, Pennsylvania; Bates & Rodgers Construction Co., Chicago, low at $282,169.

155 tons, highway, route 29, section 12B to route 28, Somerset county, New Jersey; bids March 18.

150 tons, highway project, Queens county, New York; bids March 2.

133 tons, state highway work in Los Angeles county, California; general contracts to C. O. Sparks & Mundo Engineering Co., Los Angeles.

118 tons, state highway work in Tulare county, California; bids March 14.

117 tons, state crossing in Los Angeles county, California; bids March 14.

110 tons, highway and bridges, Missippi; bids March 6.

100 tons, postoffice, Holyoke, Mass.; Tremaglio Bros., Waterbury, Conn., low on general contract.

Unstated, grain elevator at Vancouver, Wash.; general contract to Alloway & Georg, Spokane.

Unstated, concrete piers for 615-foot cantilever span; bids at Juneau, Alaska, March 4, by Alaska road commission.

Wire

Wire Prices, Page 51

Pittsburgh—With jobbers heavily stocked on merchant wire products, building operations and alterations curtailed by winter weather, and the manufacturng trade taking only small lots of plain wire, buying is adversely affected. Demand from southern jobbers appears to be delayed for several weeks. Prices are $2.35 per keg on wire nails, 2.20c on plain wire and galvanized barbed wire, 2.85c.

Cleveland—Books for second quarter have been opened at unchanged prices, 2.20c for plain wire, and $2.35 per keg for nails. February tonnage booked here was larger than that in January, and makers anticipate shipments on the remainder of first quarter contracts this month will exceed those of last month.

Chicago—Wire demand shows a further slight improvement. The upturn in specifications since mid-January has been fairly consistent. Wire products are moving at a fair rate in agricultural districts of the South and Southwest, but the reason affects distribution in northern states adversely. Manufacturers' wire is in good demand from automotive interests, with some betterment noted in specifications from miscellaneous users. Prices hold at $2.40 for wire nails, and 2.25c for plain wire.

Boston — Most specialty departments in wire drawing mills have retained recent gains, but some other departments are less active. Plain bright wire is firm at 2.30c, Worcester, Mass., while spring wire, demand for which is fairly steady, holds at 3.30c, Worcester.

Strip Steel

Strip Prices, Page 51

Pittsburgh — Reduction of $1 a ton on hot-rolled strip filed Feb. 20 by Pittsburgh district producers was reinstated three days later by the counter filing of an advance of $1 a ton. Therefore, the market is 1.75c base, Pittsburgh, through March and into the second quarter. Cold-rolled remains steady and without change at 2.40c, Pittsburgh or Cleveland. February demand for strip was the heaviest in at least eight or nine months, volume being well divided between both carbon and stainless grades.

Cleveland — Demand continues strong, with most orders coming from automobile manufacturers. Some makers placed a deadline March 3 on receipt of specifications for cold-rolled strip for delivery before April I. Books for second quarter have been opened, with cold-rolled strip reaffirmed at 2.40c, base, Cleveland. Hot strip has been restored to 1.85c, Chicago, while the Pittsburgh base holds at 1.75c, the recent $1 a ton reduction there having been withdrawn before its intended effective date, March 2.

Chicago — Elimination of the recent reduction of $1 a ton on hot-rolled strip restores the market to the 1.85c, Chicago, level prevailing several weeks ago. Cold-rolled strip is unchanged at 2.40c, Pittsburgh-Cleveland. Business in hot-rolled strip shows further gains, while shipments of cold-rolled material remain heavy, particularly to the automotive industry. Indications point to further gains in shipments of all grades during March.

Boston — Cold strip specifications have improved slightly, but give little gain in mill operations. Most of the increase is traced to better automobile parts and miscellaneous industrial demand. Prices are firm at 2.60c, Worcester, Mass.

Pipe

Pipe Prices, Page 51

Pittsburgh—Improvement in welded pipe business is looked for this month. Line pipe is inactive, the only recent inquiry being for a small lot for government work at Fort Knox, Ky. Boiler tube demand has been expanding. Discounts on tubular products hold unchanged, but boiler tube makers are now quoting a revised schedule on list prices. This revision under date of Feb. 1 has not affected boiler tube discounts but certain changes have been made in list prices per foot.

Cleveland—Iron and steel pipe of various sizes for the 12,725 Van Sweringen line freight cars recently awarded offers the largest single tonnage pending here. Each car will require about 60 feet of pipe; tonnage is estimated around 200 tons. It interests cast pipe producers to read in the list of PWA expenditures for materials in the month ending Dec. 15, the sum of $332,981 for cast iron pipe and fittings, and $301,390 for "firearms." Total expenditures for material were $13,276,748, including $3,301,471 for "steelworks and rolling mill products, structural and ornamental metal work." For direct PWA payrolls the total was $15,020,613.

Chicago—Cast pipe sales are more active. Pending work to be placed shortly includes 3000 tons for Springfield, Ill., 4000 to 5000 tons for several small towns near Springfield, 1250 tons for a Cook county infirmary, and 1200 tons for Council Bluffs, Iowa. In addition many small nearby muncipalities have projects pending for which approval of loans or pipe specifications is awaited. Chicago has placed 1800 tons of 12 and 16-inch pipe from its recent inquiry for 2345 tons.

Boston—Demand for cast pipe is slower and is not likely to be revived until weather conditions improve. Some specifications against old orders have been held up due to unfavorable trenching conditions.

New York—Cast pipe inquiry is slightly heavier. Bids go in this week on the largest pending tonnage in the state, close to 2700 tons for Watervliet, N. Y.

Birmingham, Ala.—Cast pipe production will pick up a little in the next two weeks, new business in hand warranting greater output.

Cast Pipe Placed

6000 tons, Porto Rico, bulk to United States Pipe & Foundry Co., Burlington, N. J.

1800 tons, 12 and 16-inch, Chicago, to Glamorgan Pipe & Foundry Co., Lynchburg, Va.

650 tons, 16-inch, Oakland, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

120 tons, 12-inch and under, 4600 feet, Astoria, Oreg., to Pacific States Cast Iron Pipe Co., Provo, Utah.

100 tons, small sizes, Hartwick, Vt., to R. D. Wood & Co., Florence, N. J.

Steel Pipe Placed

Unstated tonnage for dredges CURRITUCK and HENRY BACON, United States engineer, Wilmington, N. C., to Novelty Steam Boiler Works, Baltimore.

Cast Pipe Pending

900 tons, 6-inch, Fort Stanton, N. Mex.;

400 tons, Georgetown, Ill.

300 tons, Chicago sanitary district; bids March 15.

245 tons, also fittings, Kings Park hospital, New York; bids March 14.

220 tons, state hospital, Wingdale, N. Y.

210 tons, also fittings, state hospital, Oneonta, N. Y.; bids March 20.

200 tons, New York state highway

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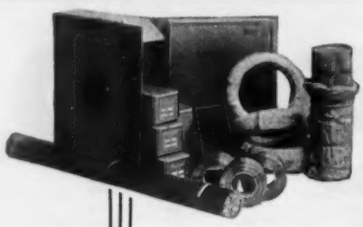
work, opening of March 2.
130 tons, also fittings, state hospital, Mount Morris, N. Y.; bids March 6.
100 tons, also fittings, state hospital, Beacon, N. Y.; bids in.
Unstated tonnage, 1400 feet, 2, 4 and 6-inch, waterworks, Houston, Mo.; also 75,000-gallon steel elevated tank; bids in.

Steel Pipe Pending

9300 tons, 48, 54 and 60-inch, city of St. Louis; bids March 16. Alternate bids on concrete pipe.
500 tons, pontoons and 1000 feet pipe, army engineers, Kansas City, Mo.: McClintic-Marshall Corp., Pittsburgh, low.
100 tons, boiler tubes for ten Northern Pacific locomotives reported placed with Globe Steel Tubes Co., Milwaukee, through Baldwin Locomotive Works, Philadelphia.
Unstated tonnage, 8300 feet, 8⅝-inch and 10,000 feet, 6⅝-inch, army engineers, Kansas City, Mo.; bids March 7.

Allis-Chalmers Mfg. Co., Milwaukee, has moved its district sales office at Buffalo to the Liberty Bank building. A. D. Brown is district manager, in charge.



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Pig Iron

Pig Iron Prices, Page 52

Pittsburgh—Shenango Furnace Co. blew in one of its Sharpsville, Pa., stacks Feb. 24, this unit having been idle since last summer. The Neville Island merchant furnace of Davison Coke & Iron Co., banked at mid-February, continues inactive. Iron for ingot molds and steel mill rolls is moving at a fair rate. No test of the new $17, Neville Island, base on basic iron has been recorded, but foundry at $18 and bessemer at $18.50 hold steady.

Cleveland—Producers have opened books for second quarter at the unchanged base price of $17.50, Cleveland, Toledo, Detroit and Erie, Pa. So far few contracts have been placed. Ore prices for the season have not yet been determined. Contracts call for delivery of about 30 per cent more iron in March than in February, and February shipments showed a similar advance over January.

Chicago—Opening of second quarter books at unchanged prices of $17.50, furnace, for No. 2 foundry and malleable has been accompanied by a substantial increase in sales. Shipments against a number of first quarter contracts already have been completed and the fact that some new purchases are for March as well as for second quarter shipments shows that consumers underestimated rather than overestimated requirements during the past few months.

Boston—Buying is in small lots with no large inquiries out. Opinion prevails, however, that second quarter shipments will be better than the first.

New York—Second-quarter contracting, at unchanged prices, is expected to develop shortly. At present trading is light, with some consumers still operating on tonnage laid in last December. Navy has bids on 165 tons of foundry iron for various yards.

Philadelphia—Sellers have opened books for second quarter at unchanged prices, but little contracting has developed. Shipments are confined largely to moderate releases against old contracts. An eastern merchant furnace has been banked temporarily, to permit diversion of coke for domestic heating purposes, for which there is abnormal demand because of severe weather conditions.

Buffalo—February shipments were

75 to 100 per cent over the January figure. Bethlehem Steel Co. has lighted another furnace at Lackawanna.

Cincinnati—Heavier ordering of iron during the past week was attributed in part to desire for price protection, although books were opened March 1 for second quarter with no change in quotations.

St. Louis—Indications point to gradual increase in the melt and shipments of iron until summer. In some sections foundry operations are three times the rate at the same date last year.

Birmingham, Ala.—Demand has increased moderately while quotations remain unchanged.

Scrap

Scrap Prices, Page 53

Pittsburgh—Renewed interest in scrap last week resulted in establishment of present quotations on important open-hearth grades, with marked preference for scrap rails. This has resulted in as high as $15 being paid for that grade. An unusual situation developed last week at a down-river mill which, shut off on barge shipments, was forced to pay as high as $15.50 for No. 1 heavy melting steel.

Cleveland — Prices of steel and iron scrap are strong, though no advances have been made. In the valleys they have increased slightly.

Chicago—Heavy melting steel has advanced 50 cents a ton to $12, the highest level since late 1930. Most other grades also are 25 cents to $1 a ton above previous levels, principally from absence of sufficient supplies to accommodate dealers' demands.

Boston—Active grades of scrap are stronger with shipments handicapped in some sections by adverse weather conditions. No. 1 heavy melting steel is higher for delivery to Worcester, Mass., for barge loading and for outside shipment.

New York—For barge loading, several grades have advanced, dealers paying $8 for No. 2 heavy melting steel and $4 for borings and turnings. Pencoyd, Pa., continues to take moderate shipments of No. 2 at $9.50 delivered.

Philadelphia—Should steelmaking operations in this district show an appreciable improvement higher prices on scrap this month appear inevitable, for there is strong demand from abroad and increasing inquiry in western Pennsylvania and the Middle West. Recent export business includes a cargo of steel for England.

A purchase of 9000 to 10,000 tons of No. 1 heavy melting steel has been made for Sparrows Point, Md.

Buffalo—Dealers in scrap are marking time, holding material for 50 cents to $1 a ton above the best prices quoted.

Detroit—Iron and steel scrap prices are up 25 to 75 cents, chiefly in sympathy with stronger outside markets drawing upon Detroit offerings. Actual consumer purchases recently have been light. Offerings are increasing.

Cincinnati — Prices of iron and steel scrap have advanced sharply here, in harmony with other districts. Little improvement is noted in demand as mills are well supplied.

St. Louis—Notable strength continues in iron and steel scrap, on practically all grades. Steel grades have led the advance.

Birmingham, Ala.—Activity in steel and iron scrap has shown no increase but prices are strong and several grades have been advanced. It is reported the Tennessee Coal, Iron & Railroad Co. recently bought more than 40,000 tons of steel rails from the Atlantic Coast line and Seaboard Air Line.

Toronto, Ont. — Demand for iron and steel scrap is expanding. Mills are showing some interest and shipments of heavy melting steel and turnings are going forward in small lots.

Semifinished

Semifinished Prices, Page 51

Strong demand still features the sheet bar market, with the bulk of shipments required by tin plate mills. Forging billet shipments in February were at about the January rate, but straight carbon rerolling billets showed an improvement. Bolt and nut makers are taking only small lots of wire rods.

Iron Ore

Iron Ore Prices, Page 52

New York — Further substantial arrivals of foreign iron ore are noted in the East, with prices tending higher. The recent arrival of ore at Fairfield, Ala., for the United States Steel Corp.'s subsidiary there involved 6750 tons of Ouenza, Africa, iron ore, and not manganese ore, as reported from Birmingham.

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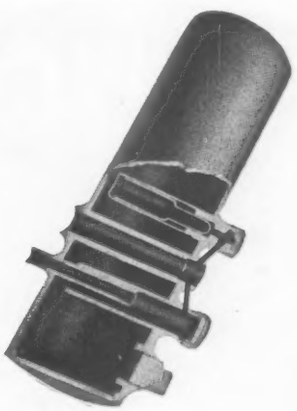

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Metals

Nonferrous Metal Prices, Page 52, 53

New York—Nonferrous metals presented a generally steady appearance this week although demand was not of outstanding proportions in any line.

Copper—Resale copper could be had early in the period at 7.87½c, Connecticut, but later metal at this level disappeared. Fair business was done by first-hands late in the period for the first time in several weeks at 8.00c, for both spot and second quarter shipment. The code hearing has been re-scheduled for March 12.

Zinc—A few sales were made from day to day but the aggregate was not large. Prices were generally steady at 4.40c, East St. Louis and 4.75c, New York, although at least one small lot went at a concession.

Lead—Fair business was done for delivery through March. Books are open for April but buying for this month has been light to date. Prices were steady.

Tin—Prices firmed up late in the week following earlier easiness. A few small lots were booked. February deliveries of tin declined to 2940 tons from 3310 tons in January and 3045 tons a year ago.

Aluminum—Secondary ingot prices showed less tendency to advance due to reports that important automotive interests may reduce or drop use of the metal and turn to cast iron. Little change was shown in virgin metal.

Antimony—The market firmed up but little buying was done.

Coke

Coke Prices, Page 51

Improved demand continues for Connellsville beehive coke with several large furnace coke orders in the market last week. One of these was for furnace grade for a Sharpsville, Pa., interest, which had formerly used by-product. Utilities have been heavier buyers. A broader market is also apparent in foundry coke with a few more orders current. Connellsville oven prices are $3.25 for standard furnace coke and $4.25 for common foundry and $5 on premium foundry. Heavy domestic demand for by-product coke still features.

With the by-product foundry coke market unchanged at $8.50, ovens, for outside delivery and $9.25, delivered, Chicago, shipments are expected to continue during March the improvement recorded in February.

Equipment

Pittsburgh—Inquiry still is fairly active for wide sheet mills with several steel producers actively figuring on installing rolling equipment to produce 72 and 84-inch widths. Owing to a recent specification from the automotive trade for wide sheets, 170 inches in length, equipment to produce this type of cold-rolled sheet likewise is being sought. One steel mill at Pittsburgh recently completed extensive repairs to a tilting-type 250-foot basic open hearth and placed the furnace again in operation. Unconfirmed report is heard at Pittsburgh that a leading equipment maker has closed on eight large rolling mills of an undisclosed nature for export to Japan.

New York—Several of the larger industrial plants are asking figures on more equipment. Bids are in on a 10-ton machine shop crane for Fort Monroe, Va. The navy department has bids on eight engine lathes.

Chicago—Equipment and machinery sales and inquiries show little change and buyers still evidence considerable caution in making large commitments. Government projects contribute a large portion of current orders and inquiries.

Boston—Shops making special and textile mill machinery are doing the heaviest business in New England. More equipment for navy yards is up for delivery in this district.

Cleveland—Machinery and equipment sales are holding in fair volume, although no large lists are reported. A manufacturer of metering and control equipment reports good demand from refineries and distilleries, with the steel mill market quiet.

Tin Plate

Tin Plate Prices, Page 50

Pittsburgh—Tin plate operations in this district advanced 10 points last week to 80 per cent. This was supported chiefly by the leading maker which stepped up its operations to 85 per cent. Other producers are sharing in the present heavy volume of canmakers' buying. Base prices on tin mill products continue firm and unchanged.

New York—Domestic tin plate specifications are heavy, but foreign demand which was brisk in January has subsided.

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CINCINNATI, O. U.S.A.
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Pacific Coast

Pacific Coast Prices, Page 51, 52, 54

San Francisco—(*By Air Mail*)—Activity has been limited to relatively small projects. While few structural awards were reported during the week, pending business exceeds 15,000 tons.

Awards of concrete bars were the smallest for any week of the year and totaled less than 400 tons. The largest was 133 tons for state highway work in Los Angeles county, California, placed with a Los Angeles general contractor. Bids have been opened on 245 tons for two state bridges in Santa Barbara county, and on 171 tons for highway work in Montana. New inquiries include 118 tons for state highway work in Tulare county, California, and 117 tons for a state crossing in Los Angeles county.

Structural shape awards were confined to lots of less than 100 tons. Golden Gate Iron Works, San Francisco, was low bidder on 100 tons for trusses for the United States forest service, San Francisco. The largest inquiry involves 3200 tons of steel sheet piling for a bulkhead at Government island, Oakland, bids opened March 1.

Awards of cast iron pipe, 903 tons, were the highest for any week of the year. So far this year 2173 tons have been placed, compared with 4147 tons for the corresponding period in 1933. The United States Pipe & Foundry Co. took 650 tons for Oakland. The largest pending project calls for 360 tons for Morgan Hill, Calif., bids March 1.

Northwest Activity Grows

Seattle—Activity in the Pacific Northwest iron and steel is increasing. Prices are firm. Public works construction leads, few private enterprises having developed.

Shapes awards were in the lead during the week and included: 335 tons for Fort Lewis, Wash., barracks, to Young Iron Works, Portland, Oreg.; 230 tons for Fort Lewis gun sheds, to Pacific Coast Steel Corp., Seattle, at $231,200; 160 tons for Fort Lewis stables to Isaacson Iron Works, Seattle., general contract to Nels Mortenson & Co., Seattle; 125 tons for Fort Lewis ordnance repair shop, to Wallace Bridge & Structural Steel Co., Seattle.

Other contracts closed included: 350 tons of cast iron floor plates for the navy machine shop at Pearl Harbor, T. H., to the Olympic Foundry Co., Seattle; 120 tons cast iron pipe, 12-inch and smaller, for Astoria, Oreg., to Pacific States Cast Iron Pipe Co., Provo Utah; 50 tons cast iron pipe for Bremerton, Wash., to United States Pipe & Foundry Co., Burlington, N. J.; 100 tons reinforcing bars for Fort Lewis administration building and bachelors' quarters, to Pioneer Sand & Gravel Co.; small tonnage of shapes for the same project to Isaacson Iron Works; general contract for this project held by Hoard Engineering Co., Seattle.

The contract for 120 floor plates for the navy machine shop at Pearl Harbor is of unusual interest. Each unit, cast by the Olympic Foundry Co., weighs 2½ tons, and is 5 x 5 feet and 6 inches thick. They were machined by the Johnson Mfg. Co., Seattle, to a tolerance of 0.005 inch.

The foundry trade reports business somewhat better, but prices still low. Plants are paying $7.50 to $8, net ton, for cast iron scrap, f.o.b. cars plants. The supply is ample. Columbia pig iron is being used generally in this territory, No. 1 being quoted at $22.50 gross, f.o.b. plant. Oriental buyers still are seeking suitable steel scrap here but stocks are low and the market is firm.

Steel in Europe

Foreign Steel Prices, Page 54

London — (*By Radio*) — Middlesbrough pig iron and semifinished steel producers are sold well ahead and business continues good. Demand for structural steel is active. Scottish trade is improving, but in the Midlands conditions are much quieter, with works busy.

Inquiries for steel for export are circulating and the Argentine market is showing signs of revival. Tin plate is meeting Italian competition in the Mediterranean market.

The Continent reports improved export demand, especially for bars and structural shapes. Germany has booked some good Asiatic orders.

Federation of Iron and Steel Manufacturers has adopted a plan for reorganizing the British Steel industry, including a quota system on production, control of sales and prices, a levy on home sales to stimulate exports and formation of an export body under control of the reorganized National Steel Federation. Protective duties are to be continued to prevent dumping of foreign products.

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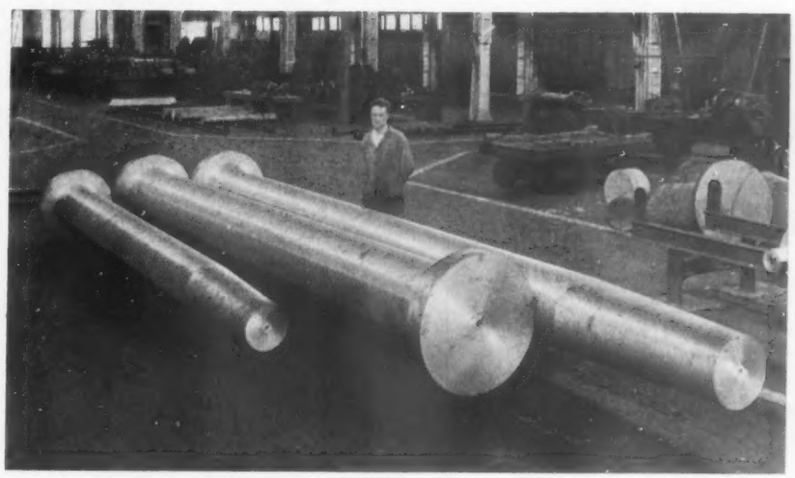

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Men of Industry

(*Concluded from Page* 19)

ed the 1933 Lamme medal of the American Institute of Electrical Engineers "for his distinguished career in connection with the design, installation and operation of electrical machinery and equipment." From 1891 to 1897 he was a chief electrical engineer of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and has been a leader in the development of alternating-current.

□ □ □

R. B. Schenck, who joined the metallurgical staff of the Pittsburgh Crucible Steel Co., Pittsburgh, several months ago, has been recalled by the Buick Motor Co. and on March 1 resumed his position as chief metallurgist for the company, at Flint.

□ □ □

O. G. Houser, assistant district manager, Continental Supply Co., with headquarters at Tulsa, Okla., has been made district manager of the tubular goods division, in charge of sales in Oklahoma and Kansas.

□ □ □

Charles A. Thomas has been appointed Detroit district sales manager of the Mahoning Valley Steel Co., Niles, O., with offices at 2-228 General Motors building. He lately has been a special representative of the Thomas Steel Co., Warren, O.

□ □ □

Charles A. Sherwood, purchasing agent, Standard Oil Co. of Ohio, Cleveland, and widely known by steel salesmen in the Middle West, retired from active service, effective March 1. Employed by the company 13 years after its organization by John D. Rockefeller, he has seen 50 years' service. Samuel H. Elliott succeeds him.

□ □ □

Henry Clarke has been appointed resident manager by the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., at its direct sales office opened March 1 at 333 North Michigan avenue, Chicago. Graduate of the Georgia School of Technology, he was first employed as chemist by the Atlantic Steel Co., Atlanta, Ga. Later he became metallurgist for the American Machine & Mfg. Co., Atlanta, subsequently serving in a similar capacity for the National Cast Iron Pipe Co., Birmingham. Prior to being associated with the Sloss-Sheffield Steel & Iron Co., he was with the research department of the Stockham Pipe & Fittings Co.

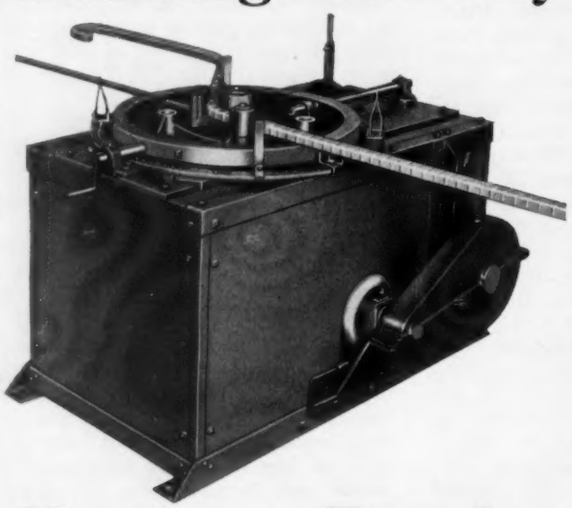
□ □ □

Harold W. Faint has been appointed to the sales engineering staff of the Udylite Process Co., Detroit, with headquarters in the Chicago office of the company. Graduate of Rutgers college, he served during the war as lieutenant in the infantry, later becoming sales and service representative on metal cleaning compounds for the J. B. Ford Co. at Chicago. Subsequently he was head of laboratories and research for the U. S. S. Lead Refinery, East Chicago, Ind., leaving this position to become chemical engineer in charge of special metallurgical and finishing problems for the Crowe Name Plate & Mfg. Co., Chicago. From the latter post he resigned recently to join the Udylite staff.

A. E. Baldwin, president, and L. K. Lindahl, general manager, of the Udylite company, recently left for an inspection trip to the West Coast, where they will visit installations made by the company and survey general business conditions.

Kardong Four-way Bender

Model D-2



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CRANE—5-Ton SHEPARD Overhead Electric Traveling, 52' 4" span, 230 v. DC, also equipped for bucket & magnet operation. 350 feet of Double "A" Frame Runway.
FORGING MACHINES—AJAX, NATIONAL, ACME, Steel Frame, Late Type, Motor Drive, Sizes 1 to 5".
FORGING PRESS—1000-Ton Steam Hydraulic, complete with Pumps, Accumulator, etc.
FURNACE—500-Lb. MOORE Rapid 'Lectromelt for electric steel melting, 3 ph. with complete electrical equipment including Transformer, 2200 to 120 v. AC.
GENERATOR—TURBINE—G-E Type ATB-2-1875 KVA 3600, Form T, Amps. 2463, Speed 3600, KW 1500, 60 cy., 440 volt. Direct connected to—Curtis Steam Turbine, KW 1500, Speed 3600, Form A, 3 stage, 210 lb. steam pressure, non-condensing.
PRESS—BLISS No. 6½ Straight Side, Double Crank with spring counterbalance. Belt Drive. 54" between housings. 8" stroke.
BLISS No. 25½-H, 96" Double Crank Gap Frame, AC MD and mot. adj. 6" shaft, 33 strokes per min.
ROLL FORMING MACHINE—YODER Type H-820, direct connected MD, roll displacement 11".
SHEARS—No. 10 BUFFALO for bars and shapes, cap. up to 3-7/8" rounds and corresponding duty in other shapes. Direct con. AC MD with motor.
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WHEEL PRESSES—300 and 400-ton CALDWELL Hydraulic. 48" bet. parallel bars. Direct motor driven with AC motor and Triplex Pump, Jib Crane and Hoist.
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New England

EAST CHELMSFORD, MASS.—Town plans a waterworks system with steel tank, to cost about $75,000. Bids will be asked in March. J. Meagher is water commissioner. Metcalf & Edde, Statler building, Boston, are engineers.

New York

NEW YORK—Tube Reducing Corp., 292 Madison avenue, is completing plans to establish a plant in Pittsburgh district to produce mechanical tubing from ⅜ to 3½ inches in diameter in plain carbon and alloy steel. The company has completed equipment for seven tube plants in England, Germany, Sweden and Italy, a total of more than 30 tube-reducing machines.

NIAGARA FALLS, N. Y.—City council has authorized the expenditure of $445,000 for purchase of two 12,000,000-gallon pumps and for construction of a 54-inch main from the intake to the municipal pumping station.

WELLSVILLE, N. Y.—Sinclair Refining Co., New York, has awarded contract for several tanks to Chicago Bridge & Iron Works, Chicago, as part of the major expansion program this year.

New Jersey

NEWARK, N. J.—Mayor Meyer C. Ellenstein has applied to PWA for a grant of $9,000,000 and a loan of $21,000,000 to build and operate a municipal electric light and power plant and system.

Pennsylvania

FRANKLIN, PA.—Atlantic Refining Co. will rebuild at once a 3000-barrel oil tank at its Eclipse plant here following fire damage.

PITTSBURGH—Libbey Owens Ford Glass Co. has requested federal permission to build a pump house and lay both a 6-inch intake and a 4-inch discharge pipe line at its Dunbar, W. Va., plant.

TITUSVILLE, PA.—Titusville Iron Co. will build an addition connecting its present shops on each side of South Washington street, which has been vacated by city council for that purpose.

Ohio

DOVER, O.—Greer Steel Co. will start construction at once of a building to house a new 4-high cold strip mill which has just been authorized.

Michigan

MANISTEE, MICH. — Manistee & Northeastern Railway Co., Manistee, Mich., will rebuild its burned roundhouse, machine shop and offices at Manistee at cost of about $50,000.

DETROIT — Consolidated Steel Corp., 8825 Conant street, is planning the construction of a factory addition.

DETROIT—Metric Switch Laboratories Inc. has been incorporated with $25,000 to deal in electric switches by Stanley R. DuBrie, 1011 Van Dyke avenue.

DETROIT—Schmid Brewing Co., Wilkins street, will build a boiler plant in connection with its new brewery, and will modernize its present plant. Cost about $400,000. G. A. Mueller, 1346 Broadway, Detroit, is engineer.

FLINT, MICH.—Economy Chrome Plating Co. Inc. has been incorporated with $50,000 capital to do plating work.

by Charles Narsted, 3637 Flushing road, Flint, Mich.

JACKSON, MICH.—City plans construction of tunnel ten blocks long, to cost about $500,000, with aid of PWA funds.

JACKSON, MICH.—DeVlieg Engineering Co. has been incorporated with 500 shares no par value to manufacture machine tools, by Charles B. De Vlieg, 120 West Michigan avenue, Jackson, Mich.

MANISTEE, MICH.—Manistee & Northeastern railway plans to rebuild its roundhouse, machine shop and offices recently damaged by fire. Estimated cost is $50,000.

MONROE, MICH.—L. M. Schnagel

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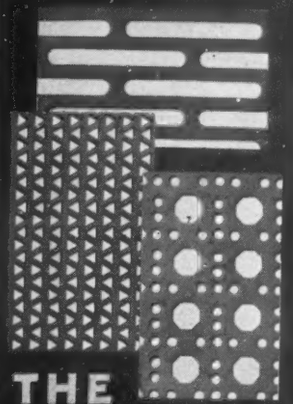

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